



City of
Los Banos
At the Crossroads of California

Contract Documents
for
Construction of

Los Banos Police Department – Gun Range

August 19, 2026

Bid Proposals must be received no later than 2:00 p.m. Sept 9, 2026
City of Los Banos City Clerk
520 J Street
Los Banos, CA 93635

City of Los Banos
Public Works Department

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Advertisement for Bids

CITY OF LOS BANOS
520 J Street
Los Banos, California 93635

Notice is hereby given that separate sealed bids for the award of contract for the **Construction of Los Banos Police Department Gun Range** will be received by the City of Los Banos at the office of the City Clerk until 2:00 p.m. Pacific Standard Time, September 9, 2026 and then at said office publicly opened and read aloud.

The major work consists of major work consists of but is not limited to: demolition and site preparation; concrete & Aggregate base hardscape; site furnishing installation (including Modular Restroom, water tank, shade structure, etc.); and other site work.

The time for completion shall be: Sixty (60) working days

The Contract Documents, in their entirety, can be viewed and/or obtained from the City of Los Banos website at www.losbanos.org or at the following locations:

Central California Builders Exchange (www.cencalbx.com)

Builders Exchange of Stockton (www.besonline.com)

Valley Builders Exchange, Inc. (www.valleybx.com)

Builders Exchange of Santa Clara County (www.bxscco.com)

Dodge Data & Analytics (www.construction.com/plans/)

A payment bond prepared and executed in accordance with California Civil Code Section 9550 and a bond for faithful performance of the contract will be required of the successful bidder who is awarded the contract.

The successful bidder must comply with the latest general prevailing rate of per diem wages as determined by the Director of Industrial Relations, State of California, Department of Industrial Relations and is to be paid to the various craftsmen and laborers required to construct said improvements and is made a part of the specifications and contract for said work to which reference is hereby made for further particulars.

No contractor or subcontractor may be listed on a bid proposal or awarded a contract for public work on a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations. Contractor registration information can be found at:

<http://www.dir.ca.gov/Public-Works/PublicWorks.html>

Each bid shall be accompanied by cashier's or certified check or by a bidder's bond, made payable to the City of Los Banos and executed by a corporate surety licensed to issue surety bonds in the State of California, for an amount equal to at least ten percent (10%) of the amount of said bid and no bid shall be considered unless such cashier's or certified check or bidder's bond is enclosed therewith.

The successful bidder of this project shall have the following current and active California State Contractor's License at the time of the submission of the bid and throughout the duration of the contract: **Class A, or Class B with subcontractors with the following licenses: C-36, C-42 and/or C8**

Prospective bidders are required to attend a **mandatory** pre-bid meeting held on August 26, 2026 at 10:00am.

Bids will not be considered from bidders who were not physically in attendance at the mandatory

pre-bid meeting.

Bidders shall refer to the Contract Document's Information for Bidders for complete instructions.

Bidders are solely responsible for the cost of preparing their bids.

The City specifically reserves the right, in its sole discretion, to reject any or all bids, to re-bid, or to waive inconsequential defects in bidding not involving time, or quality of the work. The City may reject any and all bids and waive any minor irregularities in the bids.

Information for Bidders

Sealed bids will be received by the City of Los Banos (herein called the "Owner"), at the office of the City Clerk until 2:00 p.m. Pacific Standard Time (PST), on September 3, 2026, then, at said office, publicly opened and read aloud. Owner shall reject all bids received after the specified time and will return such bids to bidder unopened. Bidders must submit bids in accordance with these instructions. No emailed or faxed bids will be accepted.

The major work consists of major work consists of but is not limited to: demolition and site preparation; concrete & Aggregate base hardscape; site furnishing installation (including Modular Restroom, water tank, shade structure, etc.); and other site work. The time for completion is: Sixty (60) working days

Each bid must be submitted in a sealed envelope and addressed to the City of Los Banos at 520 J Street, Los Banos, CA 93635. Each sealed envelope containing a bid must be plainly marked on the outside as **Los Banos Police Department Gun Range: Attention City Clerk**, and the envelope shall also bear on the outside, the name of the bidder, and their address. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed to the City of Los Banos at 520 J Street, Los Banos, CA, 93635, and also clearly state, **"Los Banos Police Department Gun Range: Attention City Clerk"**.

A complete bid includes the Bid Form, List of Subcontractors, Equal Employment Opportunity, Non-Collusion Affidavit, Debarment and Suspension Certification, Bid Schedule, Experience, Bid Bond with surety, and a copy of a current California State Contractor's License. Any signed Addendum, if issued, must also be submitted with the sealed bid. The Total Bid Amount must be filled in, in ink or typewritten, and the bid must be fully completed and executed when submitted. Only one set of original bid forms are required to be submitted. Mistakes must be corrected and the correction inserted; correction must be initialed in ink by person or persons signing the bid. No conditional bids will be accepted.

The bid shall be signed by a person or persons legally authorized to bind bidder to the contract. The individual or individuals signing each document shall warrant that they are authorized to bind the bidder.

The Owner may waive any informalities or minor defects or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within 30 days after the actual date of the opening thereof. Should there be reasons why the contract cannot be awarded within the specified period, the time may be extended by mutual agreement between the Owner and the bidder.

Each bid must be accompanied by a bid bond payable to the Owner for ten percent (10%) of the total amount of the bid. As soon as the bid amounts have been compared, the Owner will return the bid security of all except the three lowest responsive and responsible bidders. Once a bid has been awarded, and the payment bond and performance bond of the successful bidder has been received by the Owner, the bid security of the three remaining lowest responsive and responsible bidders will be returned.

All bonds must be acknowledged before a Notary Public by both the bidder and the surety. Attorneys-in-fact who sign bid bonds or payment bonds and performance bonds must file with each bond a certified and effective dated copy of their power of attorney.

Award and Execution of Contract

The party to whom the contract is awarded will be required to execute the Agreement and obtain the performance bond and payment bond along with satisfactory evidence of insurance within ten (10) calendar days from the date when the Notice of Award is delivered to the successful bidder. The Notice of Award shall be accompanied by the necessary Agreement and bond forms. In case of failure of the bidder to

execute the Agreement, the Owner may, at his option, consider the bidder in default, in which case the bid bond accompanying the bid shall become the property of the Owner.

A performance bond and a payment bond, each in the amount of 100% of the Contract Price, with a corporate surety named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570, will be required for the faithful performance of the contract. The payment bond must be issued by an admitted surety insurer holding a certificate of authority to transact surety insurance in California issued by the Insurance Commissioner.

All bonds must be acknowledged before a Notary Public by both the bidder and the surety. Attorneys-in-fact who sign bid bonds or payment bonds and performance bonds must file with each bond a certified and effective dated copy of their power of attorney.

The Owner, within 15 days of receipt of the performance bond, payment bond and Agreement signed by the party to whom the contract was awarded, shall sign the Agreement and return to such party an executed duplicate of the agreement. Should the Owner not execute the Agreement within such period, the bidder may, by written notice, withdraw his signed Agreement. Such notice of withdrawal shall be effective upon receipt of the notice by the Owner, and the bidder may terminate the Agreement without further liability on the part of either party.

The Notice to Proceed shall be issued within 10 days of the execution of the Agreement by the Owner. Should there be reasons why the Notice to Proceed has not been issued within such period, the time may be extended upon mutual agreement of both parties.

All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout.

Subcontractors

The subcontractors listed by bidder in the bid shall list therein the name and address of each subcontractor to whom the bidder proposes to subcontract portions of the work in an amount in excess of one-half of one percent (0.5%) of the total bid or \$10,000, whichever is greater, in accordance with the Subletting and Subcontracting Fair Practices Act, commencing with Section 4100 of the Public Contract Code. The bidder's attention is invited to other provisions of the Act related to the imposition of penalties for a failure to observe its provisions by using unauthorized subcontractors or by making unauthorized substitutions.

Registration with California Department of Industrial Relations (DIR)

A contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded. Labor Code Section 1771.1(a) requires contractors and their subcontractors to possess and maintain such registration with DIR in order to be awarded and to perform on public works projects (regardless of funding source).

Pursuant to Section 1771.4, each contractor and subcontractor shall furnish certified payroll records to the Labor Commissioner at least monthly and in a format prescribed by the Labor Commissioner of the DIR. Until such time that the DIR gives awarding agencies direct access to all certified payrolls submitted by contractors and subcontractors, contractor and their subcontractors are also required to submit copies of payroll records to Owner on a monthly basis. Information on the above can be found at:

<http://www.dir.ca.gov/Public-Works/PublicWorks.html>

Prevailing Wage

This work is subject to prevailing wage requirements. If there is a difference between the minimum wage

rates predetermined by the Secretary of Labor and the prevailing wage rates determined by the Director of the Department of Industrial Relations of the State of California for similar classification of labor, the contractor and his subcontractor shall not pay less than the higher wage rate. In accordance with the provisions of Section 1773 of the Labor Code of the State of California, the Owner has obtained from the Director of the Department of Industrial Relations, the general prevailing rate for each craft, classification, or type of workman required for execution of the Agreement. A copy of said prevailing rate of per diem wages is on file in the office of the Owner, and available from the California Department of Industrial Relations' Internet web site at <http://www.dir.ca.gov/DLSR/PWD>.

The Federal minimum wage rates for this work as predetermined by the United States Secretary of Labor may be examined at the offices described above where the Contract Documents may be seen. Addenda to modify the Federal minimum wage rates, if necessary, will be posted on the internet at www.losbanos.org. Future effective general prevailing wage rates, which have been predetermined, are on file with the California Department of Industrial Relations and are referenced but not printed in the general prevailing wage rates.

Pre-Bid Meeting

A mandatory pre-bid meeting and project site tour will be held on August 26, 2026 at the Public Works Office. The address for the mandatory meeting is at 411 Madison Ave, Los Banos CA, 93635 in Los Banos, California. The start time for the meeting is 10 a.m. sharp.

Bidders must satisfy themselves as to the accuracy of the estimated quantities in the Bid Schedule by examination of the site and a review of the drawings and specifications including addenda. After bids have been submitted, the bidder shall not assert that there was a misunderstanding concerning the quantities of work or the nature of the work to be done. The failure or omission of any bidder to do any of the foregoing shall not relieve any bidder from any obligation with respect to his bid.

The Contract Documents contain the provisions required for the construction of the project. The Owner will not be responsible for, nor be bound by, any oral instructions, interpretations, or explanations issued by the Owner or its representatives. Any request for clarifications or questions of the Contract Documents shall be made in writing or email and deliverable to:

City of Los Banos Public Works Department
Attn: Jelene de Melo
jelene.demelo@losbanos.org
411 Madison Avenue
Los Banos, CA 93635

Requests for clarification or questions shall be delivered to the Owner before 5:00 p.m. PDST on September 2, 2026. Any Owner response to a request for clarification, questions and answers will be posted to the City's website at www.losbanos.org no later than 5:00 p.m. PST on September 4, 2026 and if necessary, shall become a part of the bid as an addendum.

Proposed timeline of events associated with the awarding of bid:

Release of Advertisement for Bid		August 19, 2026
Pre-Bid Meeting – On Site - Mandatory	10:00 a.m.	August 26, 2026
Deadline to Submit Questions/Clarifications	5:00 p.m.	September 2, 2026
Addendum/Questions/Clarifications posted	5:00 p.m.	September 4, 2026
Bid Opening	2:00 p.m.	September 9, 2026
City Council Considers Bid		October 7, 2026 (tentative)
Issuance of a Notice to Proceed	On or before:	October 19, 2026 (tentative)
Construction to Begin	On or before:	October 19, 2026 (tentative)

Qualification of Bidder

The Owner may make such investigation as it deems necessary to determine the ability of the bidder to

provide the services requested, and the bidder shall furnish to the Owner all information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid should the evidence submitted by, or investigation of, the bidder fail to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the bid and to complete the requirements contemplated therein.

Governing Law and Venue

This bid, or any contract that may result from the award of this bid, shall be deemed to be made under, and shall be governed by and construed in accordance with, the laws of the State of California. Any action brought to enforce the terms, or provision of this bid or any contract that may result from the award of this bid, shall have venue in the County of Merced, State of California.

Mandatory Bid Protest Procedure

The lack of prompt procedure to resolve disputes regarding the bidding process would impair the Owner's ability to carry out its purpose of contracting this project in a timely manner. Therefore, to the maximum extent authorized by law and notwithstanding any other procedures specified in these Contract Documents, all disputes and/or protests regarding the bidding process shall be subject to the following procedure. In submitting a bid to the Owner for this work, the bidder agrees to comply with and to be bound by this procedure.

Any bid protest must be submitted in writing to the Owner before 5:00 p.m. on the fifth (5th) business day following bid opening, and issuance of Notice of Intent to Award Construction Contract.

1. The initial protest document must contain a complete statement of the basis for the protest, and all supporting documentation. A non-refundable fee of One Thousand Dollars (\$1,000.00) made payable to the "City of Los Banos" shall accompany the protest documents and will be used by the Owner to recover costs in evaluating the bid protest. A bid protest submitted without the requisite fee shall not be considered by the Owner.
2. The party filing the protest must have actually submitted a bid for the work. A subcontractor of a party submitting a bid for the work may not submit a bid protest. Only bidders who the Owner otherwise determines are responsive and responsible are eligible to protest a bid.
3. A party may not rely on the bid protest submitted by another bidder, but must timely pursue its own protest.
4. The protest must refer to the specific portion of the Contract Documents which forms the basis for the protest.
5. The protest must include the name, address and telephone number of the person representing the protesting party.
6. The party filing the protest must concurrently transmit a copy of the initial protest document and any attached documentation to all other parties with a direct financial interest which may be adversely affected by the outcome of the protest. Such parties shall include all other bidders who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.
7. The Owner will give the protested bidder five (5) business days after the receipt of the protest to submit a written response. The responding bidder shall transmit the response to the protesting bidder concurrent with the delivery to the Owner.
8. The City Manager or his designee will make the final determination as to the validity of the protest and how to proceed.
9. The procedure and time limits set forth in this paragraph are mandatory and are the bidder's sole and exclusive remedy in the event of bid protest. The bidder's failure to comply with these procedures shall constitute a waiver of any right to further pursue the bid protest, including filing a Government Code Claim or legal proceedings.

If the Owner determines that a protest is frivolous, the protesting bidder may be determined to be non-

responsive and/or non-responsive and that bidder may be determined to be ineligible for future contract awards.

Cancellation of Contract

The Owner may terminate any contract derived from this bid as follows:

- WITHOUT CAUSE at any time by giving thirty (30) calendar days written notice to the successful bidder;
- WITH CAUSE (Default) at any time by giving ten (10) calendar days written notice to the successful bidder. Cancellation for cause shall be at the discretion of the Owner and shall be, but is not limited to; failure to supply the items, materials, equipment or services specified within the time allowed or within the terms, conditions or provisions of this bid. The successful bidder may not cancel any contract derived from this bid, without prior written consent of the Owner.

Bid Form

TO: City of Los Banos
520 J Street
Los Banos, CA 93635

In compliance with the Advertisement for Bids the undersigned, as bidder, hereby offers to provide to the Owner, in accordance with the terms and conditions in the provisions set forth in the Contract Documents the stated total bid amount quoted on this Bid Form for the work of

Los Banos Police Department Gun Range

Total Bid Amount: \$ _____

(Total Bid Amount in Written Form)

The undersigned certifies under penalty of perjury under the laws of the State of California and the United States of America, that the above quotation constitutes a bona fide offer for the work, that undersigned is a duly authorized representative of the company listed, that the quotation is in no way sham or collusive, and that the executed Agreement between the bidder and Owner constitutes acceptance of bidder's total bid for the work stated in the Contract Documents. The undersigned has read the General Provisions, Special Provisions, and Technical Specifications in these Contract Documents. The undersigned further certifies, under penalty of perjury that the Non-Collusion Affidavit required by Title 23 United States Code, Section 112 and Public Contract Code Section 7106; and the Title 49 Code of Federal Regulations, Part 29 Debarment and Suspension Certification are true and correct.

The undersigned acknowledges receipt of the following addenda: _____

Signature: _____ Date: _____

Print Name: _____ Title: _____

Name of Business: _____

Doing business as: (*Circle One*): An Individual A Partnership A Corporation

Business Address: _____

Telephone No.: _____ Fax No.: _____

E-Mail Address: _____

License Number: _____ Class & Expiration Date: _____

List of Subcontractors

As of March 1, 2015, Contractors (and Subcontractors) wishing to bid on public works contracts shall be registered with the State Department of Industrial Relations and certified to bid on Public Works contracts. Please register at: <https://www.dir.ca.gov/Public-Works/Contractor-Registration.html>

In accordance with Title 49, Section 26.11 of the Code of Federal Regulations, and Section 4104 of the Public Contract Code of the State of California, as amended, the following information is required for each Sub-contractor who will perform work amounting to more than one half of one percent (0.5%) of the Total Base Bid or \$10,000 (whichever is greater). **Photocopy this form for additional firms.**

Project: **Los Banos Police Department Gun Range**

The following will be performed (or provided) by the following subcontractors, and coordinated by bidder:

Bid Item No.	Description of Work to be Performed	Percent of Total Contract	Subcontractor's License No.	DIR Registration No.	Subcontractor's Name and Address

Equal Employment Opportunity

Contractor hereby certifies that bidder and subcontractors

- ☐ Have
- ☐ Have Not

participated in a previous contract or subcontract subject to the equal opportunity clauses, as required by Executive Orders 10925, 11114, or 11246, and that, where required, have filed with the Joint Reporting Committee, the Director of the Office of Federal Contract Compliance, a Federal Government contracting or administering agency, or the former President's Committee on Equal Employment Opportunity, all reports due under the applicable filing requirements.

Note: The above certification is part of the bid. Signing this bid on the signature portion thereof shall also constitute signature of these certifications.

Non-Collusion Affidavit

PUBLIC CONTRACT CODE 7106

In conformance with Title 23 United States Code Section 112 and Public Contract Code 7106 the bidder declares that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

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, and 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 3 years;
- Does not have a proposed debarment pending; and
- Has not been indicted, convicted, or had a civil judgment rendered against it by a court of competent jurisdiction in any matter involving fraud or official misconduct within the past 3 years.

If there are any exceptions to this certification, insert the exceptions on an additional sheet of paper and include with the bid.

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

NPDES/MS4 Compliance Certification

All construction projects within the City limits must comply with the National Pollutant Discharge Elimination System (NPDES) storm water regulation adopted by the EPA and the Phase II Small Municipal Separate Storm Sewer System (MS4) General Permit requirements, regardless of size.

The City is required under these permits to provide information to Contractors performing work within City limits about training opportunities to assist in managing potential pollutants from construction-related activities, selection, installation, implementation, and maintenance of Best Management Practices (BMPs), as well as overall program compliance. The City has provided such information and helpful links on their website at <http://www.losbanos.org/city-government/departments/public-works/> under the Storm Water Management Plan tab.

The Bidder acknowledges that they are aware of the necessity to be in compliance with the NPDES and MS4 permits while working within City limits, and that information regarding such is available on the City's website.

Note: The above certifications are part of the bid. Signing this bid on the signature portion thereof shall also constitute signature of these certifications.

Experience

Bidder shall identify three (3) most recently completed projects similar to work described in these Contract Documents.

	1	2	3
Project Title			
Public Agency			
Address			
Telephone No.			
Engineer in Charge			
Project Value (\$)			
Date Accepted			
Claims Filed?*			

*If yes, please explain below:

**Bid Schedule
For
Los Banos Police Department Gun Range**

Bidder agrees to perform all the work described in the Contract Documents for the following unit and lump sum prices and understands that the quantity of work shown is approximate only. The schedule shall be completed by the bidder with the unit and lump sum prices entered in numerals. The extensions shall be made by the bidder. In case of discrepancy between the unit prices and the extension thereof, the unit price shall be considered as correct when evaluating bids.

ITEM NO.	ITEM	QUANTITY AND UNIT		UNIT PRICE	AMOUNT
A1	Grading (Rough & Fine)	1	LS	\$	\$
A2	Temporary Erosion & Sediment Control	1	LS	\$	\$
B1	4" Concrete Flatwork (Site Finish 'C')	511	SF	\$	\$
B2	6" Concrete Flatwork (Site Finish 'D')	181	SF	\$	\$
B3	4" Thick Aggregate Base Rock (Site Finish 'E')	33	TN	\$	\$
C1	16'x30' Shade Structure (Site Feature '8')	1	LS	\$	\$
C2	4-Stall Modular Restroom (Site Feature '4')	1	LS	\$	\$
D1	Electrical Systems Improvements	1	LS	\$	\$
D2	Septic and Water System Improvements	1	LS	\$	\$
E1	Mobilization & Demobilization (NTE 5%)	1	LS	\$	\$
E2	Bonding and General Conditions (NTE 3%)	1	LS	\$	\$
TOTAL:				\$	

Note: The representations made herein are made under penalty of perjury. Any information contained in the bid which is proven false shall be considered nonresponsive and this bid shall be rejected. If award is made, it will be based on the lowest responsive, responsible base bid. The City reserves the rights to not award the bid alternative at the discretion of the City.

Bid Bond

We, _____

as Contractor, and _____

as Surety, jointly and severally, bind ourselves, our heirs, representatives, successors and

assigns, as set forth herein, to the **City of Los Banos** (herein called "Owner") for payment

of the penal sum of _____

_____ Dollars (\$_____),

lawful money of the United States. Contractor has submitted the accompanying bid proposal

for the construction of: **Los Banos Police Department Gun Range**

If the Contractor is awarded the contract and enters into a written agreement, in the form prescribed by the Owner, at the price designated by Bid Schedule, and files a payment bond and performance bond with the Owner, or substitute security in lieu thereof, in the time and manner specified by the Owner, and carries all insurance in type and amount which conforms to the General Provisions, Special Provisions, and Technical Specifications in these Contract Documents and furnishes required certificates and endorsements thereof, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

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

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

Executed on _____, 20____

(Seal if Corporation)

Contractor

By: _____

Title _____

[SIGNATURE SHEET CONTINUES ONTO NEXT PAGE]

Any claims under this bond may be addressed to:

_____ (name and address of Surety)

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

_____ (phone number of Surety's agent in California)

(Attach Acknowledgment)

Surety

By _____

(Attorney-in-Fact)

Notice: No substitution or revision to this bond form will be accepted. Sureties must be authorized to do business in and have an agent for service of process in California.

All bond forms must be acknowledged before a Notary Public by both the Contractor and the Surety. Attorneys-in-fact who sign bond forms must file with each bond a certified and effective dated copy of their power of attorney.

Agreement

SAMPLE

Note: Particulars left blank in this sample will be filled with project-specific information as outlined in these bid documents.

THIS Agreement is dated as of the _____ day of _____ in the year 20__ by and between the **City of Los Banos, a California municipal corporation** ("Owner") and [ENTER NAME AND TYPE OF ENTITY] ("Contractor").

Owner and Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

1. WORK. Contractor shall complete the work indicated in Owner's Contract Documents entitled **Los Banos Police Department Gun Range**

The work is generally described as follows:

The major work consists of but is not limited to: demolition and site preparation; concrete & aggregate base hardscape; site furnishing installation (including modular restroom, septic tank, water tank, shade structure, etc.); and other site work.

Contractor shall furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the work described herein, unless otherwise specially stated in the Contract Documents.

2. CONTRACT TIME. Contractor shall commence the work required by the Contract Documents within 10 calendar days after the date of the Notice to Proceed and will complete the same within the time period set forth in the bid, unless the period for completion is extended otherwise by the Contract Documents.

3. LIQUIDATED DAMAGES. Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the work is not completed within the time specified in Paragraph 2 herein, plus any extensions thereof allowed in accordance with Paragraph 21, Time for Completion and Liquidated Damages, of the General Provisions. The parties also recognize the delays, expense and difficulties involved in proving in a legal proceeding the actual loss suffered by Owner if the work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner Eight Hundred Dollars (\$ 800.00) for each day that passes after the time specified in Paragraph 2 herein.

4. CONTRACT PRICE. Owner shall pay Contractor for completion of the work in accordance with the Contract Documents in current funds the amount set forth in the Bid Schedule(s). The Contractor agrees to perform all of the work described in the Contract Documents for the unit and lump sum prices set forth in the Bid Schedule(s).

5. PAYMENT PROCEDURES. Contractor shall submit applications for payment in accordance with Paragraph 24, Progress Estimates, of the General Provisions. Applications for payment will be processed by Owner as provided in the General Provisions.

6. CONTRACT DOCUMENTS. The Contract Documents which comprise the entire agreement between Owner and Contractor concerning the work consists of this Agreement and the following attachments to this Agreement:

- (A) Advertisement for Bids
- (B) Information for Bidders
- (C) Bid
- (D) Bid Bond
- (E) Agreement
- (F) Payment Bond
- (G) Performance Bond
- (H) Notice of Award
- (I) Notice to Proceed
- (J) Change Order
- (K) General Provisions
- (L) Special Provisions
- (M) Technical Specifications prepared by Westwood entitled Los Banos Police Department Gun Range dated July, 2026.
- (N) Addenda

No. _____, dated _____ 20__

There are no Contract Documents other than those listed in this Paragraph 6. The Contract Documents may only be amended by change order as provided in Paragraph 19, Changes in the Work, of the General Provisions.

7. MISCELLANEOUS.

A. Terms used in this Agreement which are defined in Paragraph 1 of the General Provisions will have the meanings indicated in the General Provisions.

B. No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

C. Owner and Contractor each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents.

D. The Laws of the State of California shall govern this Agreement. Venue is Merced County. The provisions of this paragraph shall survive expiration or other termination of this Agreement regardless of the cause of such termination.

E. All bids become property of the Owner. All bids, including the accepted bid and any subsequent contract become public records per the requirements of the California Government Code, Sections 6250-6270, "California Public Records Act". Proprietary material must be clearly marked as such. Pricing and service elements of the successful bid are not considered proprietary information. The Owner will treat all information submitted in

a bid as available for public inspection once the Owner has selected a contractor. If you believe that you have a legally justifiable basis under the California Public Records Act (Government Section 6250 et. seq.) for protecting the confidentiality of any information contained within your bid, you must identify any such information, together with the legal basis of your claim in your bid. In order for the Owner to assess confidentiality of any such information on your behalf, you must request, execute and submit an Owner-prepared written agreement to defend and indemnify the Owner for any liability, costs, and expenses incurred in asserting such confidentiality as part of your bid. The final determination as to whether the Owner will assert your claim of confidentiality on your behalf shall be sole discretion of the Owner.

F. This Agreement shall not be interpreted in favor of any Party by virtue of said Party not having prepared this Agreement.

G. If any time period provided for in this Agreement ends on the day other than a Business Day, the time period shall be extended to the next Business Day.

IN WITNESS WHEREOF, Owner and Contractor have caused this Agreement to be executed the day and year first above written.

Date

By: _____
Authorized Representative of Owner (City)

Title: _____

ATTEST:

Lucille L. Mallonee
City Clerk

APPROVED AS TO FORM:

Mary Lerner
City Attorney

Date

By: _____
Authorized Representative of
Contractor

Title: _____

(Seal if Corporation)

(Attach Acknowledgement for Authorized Representative of Contractor)

Certificate of Contractor

I, _____
(Name)

certify that I am a/the _____
(Title)

designate sole proprietor, partner in partnership, or corporate officer with Contractor License
Number _____ in the entity named as Contractor in the foregoing Agreement. I hereby
expressly certify that the name of the entity to which I am associated is

(Company Name)

and that this entity is in good standing and has complied with all applicable laws and regulations,
and that I have been expressly authorized by the proper parties in this entity to execute the
Agreement on behalf of the above-named entity.

ATTEST:

Signature: _____

This form must be acknowledged before a Notary Public. The acknowledgement must be attached.

Payment Bond

We, _____

as Contractor, and _____

as Surety, jointly and severally, bind ourselves, our heirs, representatives, successors and assigns,

as set forth herein, to the **City of Los Banos** (herein called "Owner") for payment of the penal sum

of _____

_____ Dollars (\$ _____),

lawful money of the United States. Owner has awarded the contract and entered into an

Agreement with the Contractor for the construction of:

Los Banos Police Department Gun Range

If Contractor or any of his subcontractors fails to pay any of the persons named in Section 9100 of the California Civil Code, or amounts due under the Unemployment Insurance Code with respect to work or labor performed under the contract or during the one-year guarantee period, or for any amounts required to be deducted, withheld, and paid over to the Franchise Tax Board from the wages of employees of the Contractor and his subcontractors pursuant to Section 13020 of the Unemployment Insurance Code, with respect to such work and labor, then Surety will pay the same in an amount not exceeding the sum specified above, and also will pay, in case suit is brought upon this bond, such reasonable attorney's fees as shall be fixed by the court.

This bond shall insure to the benefit of any of the persons named in Section 9100 of the California Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Surety agrees that no change, extension of time, alteration, or addition to the terms of the Contract, or the work to be performed, or the Provisions shall in any way affect its obligation on this bond, and it does hereby waive notice thereof.

Contractor and Surety agree that should Owner become a party to any action on this bond that each will also pay Owner's reasonable attorney's fees incurred therein in addition to the above sum.

[SIGNATURE SHEET BEGINS ON NEXT PAGE]

Executed in four original counterparts on: _____, 20____

Contractor

(Seal if Corporation)

By: _____

Title: _____

(Attach Acknowledgment of Authorized Representative of Contractor)

Any claims under this bond may be addressed to:

_____ (name and address of Surety)

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

_____ (phone number of Surety's agent in California)

(Attach Acknowledgment)

Surety

By _____
(Attorney-in-Fact)

Notice: No substitution or revision to this bond form will be accepted. Sureties must be authorized to do business in and have an agent for service of process in California.

All bond forms must be acknowledged before a Notary Public by both the Contractor and the Surety. Attorneys-in-fact who sign bond forms must file with each bond a certified and effective dated copy of their power of attorney.

Performance Bond

We, _____

as Contractor, and _____

as Surety, jointly and severally, bind ourselves, our heirs, representatives, successors and assigns,

as set forth herein, to the **City of Los Banos** (herein called "Owner") for payment of the penal sum

of _____

_____, Dollars (\$ _____),

lawful money of the United States. Owner has awarded the contract and entered into an

Agreement with the Contractor for the construction of:

Los Banos Police Department Gun Range

The condition of this obligation is such that if the Contractor shall in all things abide by and well and truly keep and perform the covenants, and agreements in the said Contract Agreement, and any alteration thereof made as therein provided, on his part to be kept and performed at the time and in the manner therein specified, and shall faithfully fulfill the one-year guarantee of all materials and workmanship, and shall indemnify and save harmless the Owner and the Owner's Representative, and their consultants, and each of their directors, officers, employees and agents, as therein stipulated, this obligation shall become null and void, otherwise, it shall be and remain in full force and effect.

This Performance Bond shall remain in full effect during the one-year guaranty period following the completion of the work.

Surety agrees that no change, extension of time, alteration, or addition to the terms of the General Provisions, Special Provisions, and Technical Specifications in these Contract Documents shall in anyway affect its obligation in the bond, and it does hereby waive notice thereof.

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

[SIGNATURE SHEET BEGINS ON NEXT PAGE]

Executed in four original counterparts on: _____, 20____

Contractor

(Seal if Corporation)

By: _____

Title: _____

(Attach Acknowledgment of Authorized Representative of Contractor)

Any claims under this bond may be addressed to:

(Name and address of Surety)

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

(Phone number of Surety's agent in California)

(Attach Acknowledgment)

Surety

By _____
(Attorney-in-Fact)

Notice: No substitution or revision to this bond form will be accepted. Sureties must be authorized to do business in and have an agent for service of process in California.

All bond forms must be acknowledged before a Notary Public by both the Contractor and the Surety. Attorneys-in-fact who sign bond forms must file with each bond a certified and effective dated copy of their power of attorney.

Notice of Award

To: _____

Date: _____
Project: _____

The Owner has considered the bid submitted by you for the above-described work dated _____, 20____.

You are hereby notified that your bid has been accepted for the unit and lump sum prices set forth in the Bid Schedule totaling \$_____.

You are required by the Information for Bidders to execute the Agreement and furnish the required Contractor's performance bond and payment bond within ten (10) calendar days for the date of this Notice to you.

Before the Notice to Proceed can be issued, all required certificates of insurance, as stated in Section 29 of the General Provisions, and a copy of your Los Banos Business License must be submitted.

If you fail to execute said Agreement and to furnish said bonds within ten days from the date of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your bid as abandoned and as a forfeiture of your Bid Bond. The Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this Notice of Award to the Owner.

Owner

By

Title

ACCEPTANCE OF NOTICE

Receipt of the above Notice of Award is hereby
acknowledged by
(Name of Contractor)

this _____ day of _____, 20____

By _____

Title _____

Notice to Proceed

To: _____

Date: _____
Project: _____

You are hereby notified to commence work in accordance with the Agreement dated _____, 20_____, on or before _____ 20_____, and you are to complete the work by _____, 20_____.

You are required to return an acknowledged copy of this Notice to Proceed to the Owner.

Owner

By _____

Title _____

ACCEPTANCE OF NOTICE

Receipt of the above Notice to Proceed is hereby

acknowledged by

(Name of Contractor)

this _____ day of _____, 20_____

By _____

Title _____

Change Order

Order No. _____

Date: _____

Agreement Date: _____

Project: _____

Owner: _____

Contractor: _____

The following changes are hereby made to the Contract Documents:

Justification:

Change to Contract Price:

Original Contract Price: \$ _____

Current Contract Price adjusted by previous
Change Order: \$ _____

The Contract Price due to this Change Order
will be (increased) (decreased) by: \$ _____

The new Contract Price including this
Change Order will be: \$ _____

Change to Contract Time:

The Contract Time will be (increased) (decreased)
by calendar days. _____

The date for completion of all work will be: _____

The undersigned hereby agrees to the above-described amendment of the Agreement.

Contractor

Owner

This Change Order shall become a part of the Contract Documents only upon signature of both parties.

General Provisions

1. Terms and Definitions

Wherever used in the Contract Documents, the following terms shall have the meanings indicated, which shall be applicable to both the singular and plural thereof:

Addenda - Written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the Contract Documents, by additions, deletions, clarifications or corrections.

ANSI – American National Standards Institute, current designation as of the Bid date unless otherwise indicated.

ASME – American Society of Mechanical Engineers, current designation as of the Bid date unless otherwise indicated.

ASTM – American Society for Testing Materials, current designation as of the Bid date unless otherwise indicated.

AWWA – American Water Works Association, current designation as of the Bid date unless otherwise indicated.

Bid - The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the work to be performed.

Bidder - Any person, firm or corporation submitting a bid for the work.

Bonds - Bid, Performance and Payment Bonds and other instruments of security, furnished by the Contractor and his surety in accordance with the Contract Documents.

Change Order - A written order to the Contractor authorizing an addition, deletion or revision in the work within the general scope of the Contract Documents, or authorizing an adjustment in the contract price or contract time.

Completion - That date as certified by the Engineer when the construction of the project or a specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the project or specified part can be utilized for the purposes for which it is intended.

Contract Documents - The contract, including Advertisement for Bids, Information for Bidders, Bid, including Bid Representations and Certifications, Bid Bond, Agreement, Payment Bond, Performance Bond, Notice of Award, Notice to Proceed, Change Order, General Provisions, Special Provisions, Technical Specifications, Drawings, and Addenda.

Contract Price – The total monies payable to the Contractor under the terms and conditions of the Contract Documents.

Contract Time – The number of calendar or working days as stated in the Contract Documents for the completion of the work.

Contractor – The person, firm or corporation with whom the Owner has executed the Agreement.

Drawings – The part of the Contract Documents which shows the characteristics and scope of the work to be performed and which have been prepared or approved by the Engineer.

Engineer – City Engineer of the City of Los Banos, acting either directly or through properly authorized agents, such agents, acting within the scope of the particular duties entrusted to them.

Field Order – A written order effecting a change in the work not involving an adjustment in the contract price or an extension of the contract time, issued by the Engineer to the Contractor during construction.

IEEE – Institute of Electrical and Electronics Engineers, current designation as of the Bid date unless otherwise indicated.

NEMA – National Electrical Manufacturers Association, current designation as of the Bid date unless otherwise indicated.

Notice of Award – The written notice of the acceptance of the Bid from the Owner to the successful bidder.

Notice to Proceed – Written communication issued by the Owner to the Contractor authorizing him to proceed with the work and establishing the date of commencement of the work.

Owner – City of Los Banos.

Production Data – All illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the work.

Project – The undertaking to be performed as provided in the Contract Documents.

REA – Rural Electrification Association, current designation as of the Bid date unless otherwise indicated.

Samples – Physical examples which illustrate materials, equipment or workmanship, and establish standards by which the work will be judged.

Shop Drawings – All drawings, diagrams, schedules and other data which are specifically prepared for the work by the Contractor, a subcontractor, manufacturer, supplier or distributor, to illustrate some portion of the work.

Specifications – A part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.

Standards - City of Los Banos Standard Specifications, The Standard Specifications of the Department of Transportation of the State of California (Caltrans) dated 2010 and subsequent updates to that 2010 edition, and The Standard Plans of the Department of Transportation of the State of California (Caltrans) dated 2010 and subsequent updates to this 2010 edition.

Subcontractor – An individual, firm or corporation having a direct contract with the Contractor or with any other subcontractor for the performance of a part of the work at the site.

Supplier – Any person or organization who supplies materials or equipment for the work, including that fabricated to a special design, but who does not perform labor at the site.

Work – All labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in the project.

Written Notice – Any notice to any party of the Agreement relative to any part of this Agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address, or delivered in person to said party or his authorized representative on the work.

2. Order of Precedence of Contract Documents

In resolving conflicts resulting from errors or discrepancies in any of the Contract Documents, the order of precedence shall be as follows:

1. Permits from other agencies as may be required by law
2. Change orders
3. Agreement
4. Addenda
5. Contractor's Bid (Bid Form)
6. Advertisement for Bids
7. Information for Bidders
8. Supplementary General Conditions
9. General Provisions
10. Special Provisions
11. Technical Specifications
12. Drawings
13. Referenced Standard Specifications

If the conflicts cannot be resolved by the precedence prescribed above, the most stringent requirements shall prevail.

3. Venue

Contractor, and any subcontractor, supplier and any other person or organization performing any part of work, agree that each of them will waive jurisdiction and venue and shall submit to the jurisdiction of the courts of the State of California in the County of Merced, regardless of residence or domicile, with respect to any actions or suits at law or in equity arising under or related to the bidding, award or performance of the work or with regard to any matter whatsoever arising out of or relating to the validity, construction, interpretation or reinforcement of the Agreement as against Owner or any of their consultants, and/or any of their respective directors, officers, employees, representatives or agents.

4. Giving Notice

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

5. Cumulative Remedies

The duties and obligations imposed by these General Provisions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon Contractor by the General Provisions and all of the rights and remedies available to Owner thereunder are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by laws or regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

6. Non-discrimination

During the performance of the project, Contractor and subcontractors shall not unlawfully discriminate against any employee or applicant for employment because of race, color, ancestry, religion, sex, national origin, marital status, age, medical condition (cancer-related), physical handicap (including AIDS), or sexual orientation. Equal employment extends, but is not limited to recruitment, compensation, benefits, layoff, termination, and all other conditions of employment. Contractor and Contractor's Subcontractors shall ensure that the evaluation/treatment of their employees and applicants for employment are free of such discrimination. Contractor and Contractor's Subcontractors shall comply with the provisions of the Fair Employment and Housing Act (Government Code, Section 12900 et seq.) and the applicable regulations promulgated there under (California Administrative Code, Title 2, Section 7285.0 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code, Section 12900, set forth in Chapter 5 of Division 4 of Title 2 of the California Administrative Code and incorporated into this agreement by reference and made a part hereof as if set forth in full.

Contractor and any of Contractor's Subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.

Contractor shall include the nondiscrimination and compliance provisions of the clause in all subcontracts to perform work under the contract.

Contractor shall grant access by representative of the Department of Fair Employment and Housing and the Owner upon reasonable notice at any time during normal business hours, but in no case less than twenty-four (24) hours' notice, to such of its books, records, accounts, other sources of information and its facilities as said Owner shall require to ascertain compliance with this clause.

7. Non-discrimination of the Disabled

The Owner will not aid or perpetuate discrimination against a qualified disabled individual by funding as an agency, organization, or person that discriminates on the basis of handicap in providing aid, benefit, or service to beneficiaries of the program or activity. The Owner is committed to provide access to all Owner services, programs, and meetings open to the public for people with disabilities. In this regard the Owner and all of its vendors and Contractor will take all reasonable steps to ensure that disabled individuals have the maximum opportunity for the same level of aid, benefit, or service as any other individual.

8. Additional Instructions and Detail Drawings

The Contractor may be furnished additional instructions and detail drawings by the Engineer, as necessary to carry out the work required by the Contract Documents. The additional drawings and instructions thus supplied will become a part of the Contract Documents. The Contractor shall carry out the work in accordance with the additional detail drawings and instructions.

9. Schedules, Reports and Records

The Contractor shall submit to the Owner such schedules, reports, records and other data as the Owner may request concerning work performed or to be performed.

Prior to the first partial payment estimate, the Contractor shall submit schedules showing the order in which it is to carry on the work, including dates at which he will start the various parts of the work, estimated date of completion of each part and, as applicable:

- A. A detailed cost breakdown of the work under each bid item awarded. The breakdown, after receiving favorable review by the Engineer, will become the basis for partial payment determination. Elements of work shall be grouped by building, structure, pipeline, system, etc. Within each grouping, work shall be itemized by readily measurable quantities of work completed in place. For example, concrete should be in units of cubic yard including form work and reinforcing steel. Mobilization costs, bond and insurance costs, and overhead costs shall not be prorated over items of work. In the event the cost breakdown is not favorably reviewed by the Engineer, another cost breakdown shall be submitted that is mutually acceptable to the Contractor and the Engineer.
- B. The dates at which special detail drawings will be required; and respective dates for submission of shop drawings, the beginning of manufacture, the testing and the installation of materials, supplies and equipment. The Contractor shall also submit a schedule of payments that he anticipates he will earn during the course of the work.

10. Drawings and Specifications

The intent of the drawings and specifications is that the Contractor shall furnish all labor, materials, tools, equipment, and transportation necessary to complete the project in an acceptable manner, ready for use, occupancy or operation by the Owner, unless explicitly specified otherwise in the bid documents.

In case of conflict between the drawings and specifications, the specifications shall govern. Figure dimensions on drawings shall govern over scale dimensions and detailed drawings shall govern over general drawings.

Any discrepancies found between the drawings and specifications and site condition or any inconsistencies or ambiguities in the drawings or specifications shall be immediately reported to the Engineer, in writing, who shall promptly correct such inconsistencies or ambiguities in writing. Work done by the Contractor after his discovery of such discrepancies, inconsistencies or ambiguities shall be done at the Contractor's risk.

The Owner will furnish to the Contractor, free of charge, six copies of drawings and specifications for the work. The Contractor shall keep one copy of all current drawings and specifications on the job site, in good order, available to the Engineer and his representatives.

All drawings, specifications, and copies thereof furnished by the Owner are the property of the Owner. They are not to be used on other work, and, with the exception of the signed contract set, are to be returned to the Owner on request, at the completion of the work.

11. Shop Drawings, Production Data and Samples

The Contractor shall review, approve and submit to the Engineer all Shop Drawings, Production Data and Samples as may be necessary for prosecution of the Work and as required by the Contract Documents. The Contractor shall review and approve all Shop Drawings, Production Data and Samples prior to submitting them to the Engineer. By approving and submitting Shop Drawings, Production Data and Samples, the Contractor represents that he has determined and verified all materials, measurements and criteria related thereto, and that he has checked and coordinated the information contained within such submittals with the requirements of the Contract Documents. Any Shop Drawing, Production Data or Sample submitted to the Engineer without having been approved by the Contractor will be returned unreviewed to the Contractor.

For each item where shop drawings, production data or samples are required, the Contractor shall submit a minimum of six approved sets, hard copies, or one set, electronically. The Engineer shall review all shop drawings, production data and samples and retain three sets after his review. The remaining sets shall be returned to the Contractor with actions defined as follows:

- A. NO EXCEPTIONS TAKEN – Accepted subject to its compatibility with future submissions and additional partial submissions for portions of the work not covered in this submission.
- B. MAKE CORRECTIONS NOTED – Same as NO EXCEPTIONS TAKEN except that minor corrections as noted shall be made by the Contractor.
- C. REVISE AND RESUBMIT – Rejected because of major inconsistencies or errors which shall be resolved by the Contractor prior to subsequent review by the Engineer.
- D. REJECTED – Submitted material does not conform to Contract Documents in major respect.

The Engineer's review is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. It shall not include review of quantities, dimensions, weights or gauges, fabrications processes, construction methods, coordination with other trades, or construction safety precautions, all of which are the responsibility of the Contractor.

The Engineer shall not be responsible for any deviations from the Contract Documents not brought to the attention of the Engineer in writing by the Contractor and acknowledged in writing by the Engineer.

Portions of the work requiring shop drawings, production data and samples shall not begin until the submission has been favorably reviewed by the Engineer. A copy of each favorably reviewed shop drawing, product data and sample shall be kept in good order by the Contractor at the site and shall be available to the Engineer.

12. Materials, Services and Facilities

It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, supervision, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the work within the specified time.

Materials and equipment shall be so stored as to ensure the preservation of their quality and fitness for the work. Stored materials and equipment to be incorporated in the work shall be located so as to facilitate prompt inspection.

Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.

Materials, supplies and equipment shall be in accordance with samples submitted by the Contractor and reviewed by the Engineer.

Materials, supplies or equipment to be incorporated into the work shall not be purchased by the Contractor or any of Contractor's Subcontractors subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.

13. Inspection and Testing

All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the Contract Documents.

The Contractor shall provide, at his expense, the necessary testing and inspection services required by the Contract Documents, unless otherwise provided. (See Section 6 of the Special Provisions)

The Owner shall provide all other inspections and testing services not required by the Contract Documents. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having

jurisdiction specifically require any work to be inspected, tested, approved by someone other than the Contractor, the Contractor will give the Engineer timely notice of readiness. The Contractor will then furnish the Engineer the required certificates of inspection, testing or approval.

Neither observations by the Engineer nor inspections, tests or approvals by persons other than the Contractor shall relieve the Contractor of his obligations to perform the Work in accordance with the requirements of the Contract Documents.

The Engineer and his representatives will at all times have access to the Work. In addition, authorized representatives and agents of the Owner and appropriate Federal or State agencies shall be permitted to inspect all work, material, payrolls, records of personnel, invoices of materials, and other relevant data and records. The Contractor will provide proper facilities for such access and observation of the Work and also for any inspection or testing thereof.

If any work is covered contrary to the written request of the Engineer, it must, if requested by the Engineer, be uncovered for his observation and replaced at the Contractor's expense.

If any work has been covered which the Engineer has not specifically requested to observe prior to it being covered, or if the Engineer considers it necessary or advisable that covered work be inspected or tested by others, the Contractor, at the Engineer's request, will uncover, expose, or otherwise make available for observation, inspection or testing as the Engineer may require, that portion of the work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such work is not found to be defective, the Contractor will be allowed an increase in the contract price of an extension of the contract time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction and an appropriate change order shall be issued.

14. Substitutions

Whenever a material, article or piece of equipment is identified on the Drawings or Specifications by reference to brand name or catalogue number, it shall be understood that this is referenced for the purpose of defining the performance of other salient requirements and that other products of equal capacities, quality and function shall be considered. The Contractor may recommend the substitution of a material, article or piece of equipment of equal substance and function for those referred to in the Contract Documents by reference to brand name or catalogue number, and if, in the opinion of the Engineer, such material, article, or piece of equipment is of equal substance and function to that specified, the Engineer may approve its substitution and use by the Contractor. The Contractor warrants that if substitutes are approved, no major changes in the function or general design of the project will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the Contractor without a change in the contract price or contract time.

15. Patents

The Contractor shall pay all applicable royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for any such loss when a particular process, design, or the product of a particular manufacturer or manufacturers is specified, but if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Engineer.

16. Surveys, Permits and Regulations

The Engineer will furnish lines and grades as required for the construction of the work. The Contractor shall make a general check of all lines, dimensions and elevations and shall make all necessary rechecks during the progress of the work to avoid errors in construction. The Contractor shall be responsible for proper dimensions and fittings of all items of work being performed by him. Should any discrepancy be found in lines, dimensions or elevations, they shall be reported to the Engineer immediately.

The Contractor shall protect all existing property and survey monuments, including survey control monuments for this work. The Contractor is responsible for protecting and preserving survey monuments and other survey markers. Any survey monuments damaged as a direct or indirect result of construction activities shall be re-established by a duly licensed land surveyor at the Contractor's sole expense. A corner record shall be filed in accordance with State law for any reset monuments at the Contractor's sole expense.

The Contractor shall carefully preserve benchmarks, reference points and stakes and, in case of willful or careless destruction, he shall be charged with the resulting expense and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

Permits and licenses of a temporary nature necessary for the prosecution of the work shall be secured and paid for by the Contractor. Permits, licenses and easements for permanent structures or permanent changes to existing facilities shall be secured and paid for by the Owner, unless otherwise specified. The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the Work as drawn and specified. If the Contractor observes that the Contract Documents are at variance therewith, he shall promptly notify the Engineer in writing, and any necessary changes shall be adjusted as provided in Paragraph 19 of these General Provisions, Changes in the Work.

17. Protection of Work, Property and Persons

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. He will take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to all employees on the work and other persons who may be affected thereby, all the work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. He shall erect and maintain, as required by the conditions and progress of the work, all necessary safeguards for safety and protection. He shall notify owners of adjacent utilities when prosecution of the work may affect them. The Contractor shall remedy all damages, injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, any of Contractor's Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, except damage or loss attributable to the fault of the Contract Documents or to the acts or omissions of the Owner or the Engineer or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the Contractor.

In emergencies affecting the safety of persons or the work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Engineer or Owner, shall act to prevent threatened damage, injury or loss. He will give the Engineer prompt written notice of any significant changes in the work or deviations from the Contract Documents caused thereby, and a change order shall thereupon be issued covering the changes and deviations involved.

18. Supervision by Contractor

The Contractor shall supervise and direct the work. He shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. The Contractor shall employ and maintain on the work, a qualified supervisor or superintendent who shall have been designated in writing by the Contractor as the Contractor's representative at the site. The supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the work.

19. Changes in the Work

The Owner may at any time, as the need arises, order changes within the scope of the work without invalidating the Agreement. If such changes increase or decrease the amount due under the Contract Documents, or in the time required for performance of the work, an equitable adjustment shall be authorized by written change order.

The Engineer may also, at any time, by issuing a field order, make changes in the details of the work. The Contractor shall proceed with the performance of any changes in the work so ordered by the Engineer unless the Contractor believes that such field order entitles him to a change in contract price or contract time, or both, in which event he shall give the Engineer written notice thereof within seven (7) days after the receipt of the ordered change, and the Contractor shall not execute such changes pending the receipt of an executed change order or further instruction from the Owner.

20. Changes in Contract Price

The contract price may be changed only by a written change order. The value of any work covered by a change order or of any claim for increase or decrease in the contract price shall be determined by one or more of the following methods in the order of precedence listed below:

- A. Unit prices previously approved.
- B. An agreed lump sum.
- C. If a lump sum or unit price cannot be mutually agreed upon, the Contractor shall be entitled to the sum of the following costs of doing the extra work:
 1. Direct Labor Costs. Charges for cost of all the labor furnished and used by the Contractor shall be made for manual classifications up to and including general foreman. It will not include charges for assistant superintendents, superintendents, office personnel, timekeepers, and maintenance and mechanics. The time charged to extra work shall be subject to the daily approval of the Engineer and evidence of such daily approval shall be submitted with the billing. Labor rates used to calculate the costs shall be those so designated in the Advertisement for Bids. No time or charges will be allowed, except when the men are actually engaged in the proper, efficient, and diligent performance or completion of the extra work as authorized. Overtime shall not be worked without prior approval by the Engineer.
 2. Equipment Costs. Charges for the rental and operation of the equipment furnished and used by the Contractor shall be made for all prime construction and automotive equipment. It will not include charges for equipment or tools with a new cost of \$1,000.00 or less. Equipment time charges must be subject to the daily approval submitted with the billing. The equipment rental and operation rates used shall be those agreed upon by the Engineer and the Contractor prior to commencement of the extra work. No time or charges will be allowed except when equipment is actually being used for the proper and efficient performance or completion of the extra work as authorized.
 3. Material Costs. Charges for the cost of materials furnished by the Contractor shall be made providing such furnishing was specifically authorized in the extra work order and the actual use verified by the Engineer. Charges must be net cost to the Contractor delivered at the job, and vendor's invoice must accompany the billing along with verification of use of such materials by the Engineer.
 4. Tools, Supplies, Overhead, Supervision and Profit. A charge for tools, supplies, overhead, supervision and profit will be allowed in the amount of 15% of the Total Direct Labor Costs, and Material Costs, as defined above.

Any extra work performed hereunder shall be subject to all of the provisions of the contract and the Contractor's sureties shall be bound with reference thereto as under the Contract.

21. Time for Completion and Liquidated Damages

The date of beginning and the time for completion of the work are essential conditions of the Contract Documents and the work embraced shall be commenced on a date specified in the Notice to Proceed.

Time is of the essence in this Agreement. The Contractor shall proceed with the work at such a rate of progress to ensure full completion within the contract time. It is expressly understood and agreed, by and between the Contractor and the Owner, that the contract time for the completion of the work described herein is a reasonable time.

The parties hereto agree that it is extremely difficult and impractical in this case to determine the actual damages the Owner will suffer if the Contractor fails to complete the work within the contract time and for said reason, if the Contractor shall fail to complete the work within the contract time, or extension of time is not granted by the Owner, then the Contractor will pay to the Owner the amount for liquidated damages as specified in the Agreement for each calendar day that the Contractor shall be in default after the time stipulated in the Contract Documents. The time for completion of the work shall be extended, and the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due to the following, and the Contractor has promptly given written notice, as defined in Section 12 of the Special Provisions, of such delay to the Engineer:

- A. To any preference, priority or allocation order duly issued by the Owner.
- B. To unforeseeable caused beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God or of the public enemy, acts of the Owner, acts of another contractor in the performance of a contract with the Owner, fires, floods, epidemics quarantine restrictions, strikes, freight embargoes, and climatic conditions which, in the opinion of the Engineer, make prosecution of the work unreasonably difficult.
- C. To any delays of subcontractors occasioned by any of the causes specified in the above paragraphs.

22. Correction of Work

The Contractor shall promptly remove from the premises all work rejected by the Engineer for failure to comply with the Contract Documents, whether incorporated in the construction or not, and the Contractor shall promptly replace and re-execute the work in accordance with the Contract Documents and without expense to the Owner and shall bear the expense of making good all work of other contractors destroyed or damaged by such removal or replacement.

23. Suspension of Work, Termination and Delay

The Owner may, at any time and without cause, suspend the work or any portion thereof for a period of not more than ninety days, or such further time as agreed upon by the Contractor, by written notice to the Contractor and the Engineer, which notice shall fix the date on which work shall be resumed. The Contractor will resume that work on the date so fixed. The Contractor will be allowed an increase in the contract price or an extension of the contract time, or both, directly attributable to any such suspension.

If the Contractor is adjudged as bankrupt or insolvent, or if he makes a general assignment for the benefit of his creditors, or if a trustee or receiver is appointed for the Contractor or for any of his property, or if he files a petition to take advantage of any debtor's act or to reorganize under the bankruptcy or applicable laws, or if he repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment, or if he fails to make prompt payments to Contractor's Subcontractors or for labor, materials or equipment or if he disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction over the Work or if he disregards the authority of the Engineer, or if he otherwise violates any provision of the Contract Documents, then the Owner may, without prejudice to any other right or remedy and after giving the Contractor and his surety a minimum of ten (10) days from delivery of a written notice, terminate the services of the Contractor, and finish the work by whatever method he may deem expedient. In such case, the Contractor shall not be entitled to receive any further payment until the work is finished. If the unpaid

balance is less than the actual cost of completing the project, then the Contractor shall pay the difference to the Owner. Such costs incurred by the Owner will be determined by the Engineer and incorporated in a change order.

Where the Contractor's services have been so terminated by the Owner, said termination shall not affect any right of the Owner against the Contractors then existing or which may thereafter accrue. Any retention or payment of monies by the Owner due the Contractor will not release the Contractor from compliance with the Contract Documents.

After ten (10) days from delivery of a written notice to the Contractor and the Engineer, the Owner may, without cause and without prejudice to any other right or remedy, elect to abandon the project and terminate the contract. In such case, the Contractor shall be paid for all work executed and any expense sustained plus reasonable profit.

If, through no act or fault of the Contractor, the work is suspended for a period of more than ninety (90) days by the Owner or under an order of court or other public authority, or the Engineer fails to act on any request for payment within thirty (30) days after it is submitted, or the Owner fails to pay the Contractor substantially the sum approved by the Engineer or awarded by arbitrators within thirty (30) days of its approval and presentation, then the Contractor may, after the (10) days from delivery of a written notice to the Owner and the Engineer stop the work until he has been paid all amounts then due, in which event and upon resumption of the work, change orders shall be issued for adjusting the contract price or extending the contract time or both to compensate for the costs and delays attributable to the stoppage of the work.

24. Progress Estimates

On or about the last day of the calendar month, the Contractor will, except as hereinafter provided, make in writing and certify to the Owner an estimate which, in his opinion, is just and fair of the amount and value of the work completed by the Contractor up to that time in the performance of the contract. In case of work for which unit prices are named in the contract, the estimate shall be computed on the basis of said unit prices. In the case of work for which a lump sum is named in the contract, the Engineer may use a breakdown of the lump sum price submitted by the Contractor, provided that such breakdown is submitted within 10 calendar days after the execution of the Agreement in a form acceptable to the Engineer. No payment will be made to the Contractor until such schedule has been submitted to and reviewed by the Engineer. To the figure thus arrived at shall be added any amounts due the Contractor for extra work and the amount of any approved claims for extra costs to the date of the progress estimate the retained percentage hereinafter provided for shall be deducted from the total thus computed; and from the remainder, there shall be further deducted any amounts due the Owner from the Contractor for supplies or materials furnished or services rendered and any other amounts that may be due the Owner under the terms of the contract. In preparing estimates for partial payment, consideration shall be given to delivery on the site of pipe, and fittings which will become a part of the finished construction work and for which payment in full has been made by the Contractor, but no consideration will be given to preparatory work done or other materials on hand. From the balance thus determined shall be deducted the amount of all previous payments and the remainder shall constitute the partial estimate for that month. Such partial estimates shall not be required to be made by strict measurement, but may be made by measurement or by estimation or partly by one method and partly by the other and it shall be sufficient if they are approximate only. Partial estimates may be withheld or reduced if, in the opinion of the Engineer, the Contractor is not diligently and efficiently endeavoring to comply with the intent of the Agreement.

25. Progress Payments

The Owner will make payments on account of the contract as follows: Not later than the 30th day of the month following the month in which the contract is awarded, and the 30th day of each calendar month thereafter, the Owner will pay to the Contractor 95% of the amount earned by the Contractor during the preceding month at the rate of prices set forth in the contract, based on the estimate of the Engineer.

The retention will be held by the Owner until 35 days following filing of the Notice of Completion.

26. Prompt Payment

The Contractor shall promptly pay all of Contractor's Subcontractors and suppliers within ten (10) days of receipt of any progress payment, final payment or retention paid by the Owner to the Contractor. Contractor shall advise all of Contractor's Subcontractors and suppliers that all second-tier Subcontractors and suppliers must be paid within ten (10) days of their receipt of payment from the Contractor.

27. Acceptance and Final Payment

Upon receipt of written notice from the Contractor that the work is ready for final inspection and acceptance, the Engineer will promptly make such inspection, and when he finds the work acceptable under the contract, and the contract fully performed, he will promptly issue a final certificate, over his own signature, stating that the work required by this contract has been completed. The Owner then shall issue a formal Notice of Completion, and the entire balance found to be due shall be paid to the Contractor by the Owner 35 days from the date of recording by the Owner of the Notice of Completion of all work covered by this contract.

Before issuance of the Notice of Completion, the Contractor shall submit satisfactory evidence to the Owner that all payrolls, material bills, and other indebtedness connected with the work have been paid, or if not paid, then the Contractor shall submit evidence of the status of any unpaid indebtedness.

The making and acceptance of the final payment shall constitute a waiver of all claims by the Owner except the following:

- A. those arising from unsettled liens;
- B. those arising from faulty work appearing within 12 months after the date of filing of the Notice of Completion;
- C. those arising from failure to meet the requirements of the Contract Documents or the specifications; or,
- D. those arising from manufacturers' guarantees.

The acceptance by Contractor of the final payment referred to in this paragraph 27 herein, shall be a release of Owner from all claims of liability to Contractor for anything done or furnished for, or relating to, the work or for any act or neglect of Owner or of any person relating to or affecting the work, except demands against Owner for the remainder, if any, of the amounts kept or retained under the provisions of Paragraph 25, Progress Payments, herein; and excepting pending, unresolved claims.

28. Quantities and Unit Prices

The quantities noted in the schedule are approximation for comparing bids, and no claim shall be made against the Owner for excess or deficiency therein. Payment at the unit prices set forth in the schedule will constitute payment in full for the completed work and will include materials, supplies, labor, tools, machinery, and all other expenditures incident to satisfactory compliance with the contract, unless otherwise specifically provided.

The quantities of work performed will be computed for payment by the Engineer on the basis of measurements taken by the Engineer, and these measurements shall be final and binding.

29. Insurance

The Contractor shall not commence work under this Agreement until he has obtained all the insurance required under this section and such insurance has been approved by the Owner, nor shall the Contractor allow any Contractor's Subcontractor to commence work on his subcontract until the insurance required of the subcontractor has been so obtained and approved. All insurance required under this section shall be maintained at the expense of the Contractor continuously during the life of the contract up to the date of acceptance of the work by the Owner.

Commercial General Liability and Automobile Liability Insurance – The Contractor shall provide and maintain the following commercial general liability and automobile liability insurance:

- A. Coverage – Coverage for commercial general liability and automobile liability insurance shall be at least as broad as the following:
 - 1. Insurance Services Office Commercial General Liability coverage (Occurrence Form CG 0001)
 - 2. Insurance Service Office Form Number CA 0001 (ed. 1/87) covering Automobile Liability, Code 1 (any auto)
- B. Limits – The Contractor shall maintain limits no less than the following:
 - 1. General Liability – Two million dollars (\$2,000,000) per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to the project/location (with the ISO CG 2501 or insurer's equivalent endorsement provided to the Owner) or the general aggregate limit shall be twice the required occurrence limit.
 - 2. Automobile Liability – One million dollars (\$1,000,000) per accident for bodily injury and property damage combine single limit.
 - 3. If the Contractor maintains broader coverage and/or higher limits than the minimums shown above, the Entity requires and shall be entitled to the broader coverage and/or higher limits maintained by the Contractor.
- C. Required provisions – The general liability and automobile liability policies are to contain, to be endorsed to contain the following provisions:
 - 1. The Owner and its directors, officers, employees, agents and volunteers are to be covered as insured as respects: liability arising out of activities performed by on or behalf of the Contractor, products and completed operations of the Contractor, premises owned, occupied or used by the Contractor, or automobiles owned, leased, hired or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the Owner and its directors, officers, employees, agents and volunteers.
 - 2. For any claims related to this work, the Contractor's insurance shall be the primary insurance as respects the Owner and its directors, officers, employees, agents and volunteers. Any insurance, pooled coverage or self-insurance maintained by the Owner and its directors, officers, employees, agents and volunteers shall not contribute to it.
 - 3. Any failure to comply with reporting or other provisions of the policies including breaches of warranties shall not affect coverage provided to the Owner and their directors, officers, employees, agents and volunteers.

4. The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.
 5. Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days prior written notice by certified mail, return receipt requested, has been given to the Owner.
- D. Other Insurance Provisions -- The insurance policies are to contain, or be endorsed to contain, the following provisions:
1. Additional Insured Status -- The Entity, its officers, officials, employees, and volunteers are to be covered as 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 such work or operations. Coverage can be provided by endorsement to the Contractor's insurance (at least as broad as ISO Form CG 20 10 11 85 or if not available, through the addition of both CG 20 10, CG 20 26, CG 20 33, or CG 20 38; and CG 20 37, or 20 40 if a later edition is used).
 2. Primary Coverage -- For any claims related to this contract, the **Contractor's insurance coverage shall be primary and non-contributory** and at least as broad as ISO CG 20 01 12 19 as respects the Entity, its officers, officials, employees, and volunteers. Any insurance or self-insurance maintained by the Entity, its officers, officials, employees, or volunteers shall be excess of the Contractor's insurance and shall not contribute with it. This also applies to any Excess or Umbrella liability policies.
 3. Umbrella or Excess Policy -- The Contractor may use Umbrella or Excess Policies to provide the liability limits as required in this agreement. The Umbrella or Excess policies shall be provided on a true "following form" basis, with coverage at least as broad as provided on the underlying CGL insurance.
 4. Waiver of Subrogation -- Contractor hereby grants to Entity a waiver of any right to subrogation which any insurer of said Contractor may acquire against the Entity by virtue of the payment of any loss under such insurance. Contractor agrees to obtain any endorsement that may be necessary to affect this waiver of subrogation, but this provision applies regardless of whether or not the Entity has received a waiver of subrogation endorsement from the insurer.
- E. Deductibles and Self-Insured Retentions -- Any deductible or self-insured retention must be declared to and approved by the Owner. At the option of the Owner, either the insurer shall reduce or eliminate such deductibles or self-insured retentions.
- F. Acceptability of Insurers -- Insurance is to be placed with insurers having a current A.M. Best's rating of no less than A-: VII or equivalent.

Workers' Compensation and Employer's Liability Insurance -- The Contractor and all subcontractors shall cover or insure under the applicable laws relating to workers' compensation insurance, all of their employees working on or about the construction site, regardless of whether such coverage or insurance is mandatory or merely elective under law, and the Contractor shall defend, protect and save harmless the Owner and its directors, officers, employees, agents and volunteers from and against all claims, suits, and actions arising from any failure of the Contractor or any subcontractor to maintain such insurance. Before beginning work, Contractor shall furnish to the Owner satisfactory proof that Contractor has taken out for the period covered by the work under this Contract, full compensation insurance for all persons employed directly by Contractor or through subcontractors in carrying out the work contemplated under this Contract, all in accordance with the "Workers' Compensation and Insurance Act," Division IV of the Labor Code of the State of California and any Acts amendatory thereof.

The Contractor shall provide employer's liability insurance in the amount of, at least, \$1,000,000 per accident for bodily injury and disease.

The Contractor shall provide the Owner with a certificate of Workers' Compensation and Employers' liability insurance coverage.

In signing the Agreement, Contractor makes the following certification required by Section 1861 of the Labor Code:

"I am aware of the provisions of Section 3700 of the Labor Code which requires each employer to be insured against liability for workmen's compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract."

Evidences and Cancellation of Insurance – Prior to execution of the Agreement, the Contractor shall file with the Owner evidence of insurance from an insurer or insurers certifying to the coverage of all insurance required herein. Such evidence shall include original copies of the ISO CG 2010 (or insurer's equivalent) signed by the insurer's representative and certificate of insurance (Accord Form 25-S or equivalent). All evidence of shall be certified by a properly authorized officer, agent or qualified representative of the insurer and shall certify the names of the insured, any additional primary insurers, where appropriate, the type and amount of the insurance, the location and operations to which the insurance applies, the expiration date, and that the insurer will give by certified mail, written notice to the Owner at least thirty (30) days prior to the effective date of any cancellation, lapse or material change in the policy.

The Contractor shall, upon demand of the Owner, deliver to the Owner all such policy or policies of insurance and the receipts for payment of premiums thereon; and should the Contractor neglect to obtain and maintain in force any such insurance or deliver such policy or policies and receipts to the Owner, then it shall be lawful for the Owner to obtain and maintain such insurance, and the Contractor hereby appoints the Owner the true and lawful attorney-in-fact to do all things necessary for this purpose. All money paid by the Owner for insurance premiums under the provisions of this article shall be charged to the Contractor.

30. Contract Security

The Contractor shall, within ten (10) days after the receipt of the Notice of Award, furnish the Owner with a performance bond and a payment bond in penal sums equal to 100% of the contract price, conditioned upon the performance by the Contractor of all undertakings, covenants, terms, conditions and agreements of the Contract Documents, and upon the prompt payment by the Contractor to all persons supplying labor and materials in the prosecution of the work provided by the Contract Documents. Such bonds shall be executed by the Contractor and corporate bonding company licensed to transact such business in the state in which the Work is to be performed and named on the current list of "Surety Companies Acceptable Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these bonds shall be borne by the Contractor. If at any time a surety on any such bond is declared a bankrupt or loses its right to do business in the state in which the work is to be performed or is removed from the list of surety companies accepted on Federal bonds, Contractor shall within ten (10) days after notice from the Owner to do so, substitute an acceptable bond (or bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums on such bond (s) shall be paid by Contractor. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable bond to the Owner.

Attached to the bonds shall be the original, or a certified copy, of the unrevoked appointment, power of attorney, bylaws or other instrument which entitles and authorizes the person to execute the bond to do so, a certified copy of the certificate of authority or the insurer issued by the Insurance Commissioner of the county in which the Owner is located which would state that the certificate of authority of the insurer (the bonding company) has not been surrendered, revoked, cancelled, annulled, or suspended.

The performance bond shall remain in full force and effect during the warranty period of 12 months from the date of acceptance of the work by the Owner.

If requested by the Owner or Engineer, copies of the insurer's most recent annual statement and quarterly

statement filed with the Department of Insurance pursuant to Article 10 (commencing with Section 900) of Chapter 1 of Part 2 of Division 1 of the Insurance Code, shall be provided to the Owner or Engineer within 10 calendar days of the insurer's receipt of the request to submit the statements.

31. Assignments

Neither the Contractor nor the Owner shall sell, transfer, assign or otherwise dispose of the contract or any portion thereof, or of his right, title or interest therein, or his obligation thereunder, without written consent of the other party.

32. Indemnification

Contractor shall indemnify and hold harmless and defend the Owner and the Engineer and their directors, officers, employees, agents or volunteers, and each of them from and against:

- A. Any and all claims, demands, causes of action, damages, costs, expenses, losses or liabilities, in law or in equity, of every kind and nature whatsoever for, but not limited to, injury to or death of any person including Owner and/or Engineer and/or Contractor, or any directors, officers, employees, agents volunteers of the Owner, Engineer or Contractor, and damages to or destruction of property of any person, including but not limited to, Owner, Engineer and/or Contractor and their directors, officers, employees, agents or volunteers arising out of or in any manner directly or indirectly connected with the work to be performed under this Agreement, however caused regardless of any negligence of the Owner or the Engineer or their directors, officers, employees, agents, or volunteers, except the sole negligence of willful misconduct or active negligence of the Owner or the Engineer or their directors, officers, employees, agents or volunteers:
- B. Any and all actions, proceedings, damages, costs, expenses, penalties or liabilities in law or equity, of every kind or nature whatsoever, arising out of, resulting from or on account of the violation of any governmental law or regulation, compliance with which is the responsibility of Contractor.

Contractor shall defend, at Contractor's own cost, expense and risk, any and all such aforesaid suits, actions or other legal proceedings of every kind that may be brought or instituted against the Owner and the Engineer or their directors, officers, employees, agents or volunteers.

Contractor shall pay and satisfy any judgment, award or decree that may be rendered against the Owner and their directors, officers, employees, agents, or volunteers in any such suit, action or other legal proceedings.

Contractor shall reimburse the Owner and their directors, officers, employees, agents and/or volunteers, for any and all legal expenses and costs incurred by them in connection therewith or in enforcing the indemnity herein provided.

Contractor agrees to carry insurance for this purpose as set out in the specifications. See Paragraph 29 of these General Provisions for insurance specifications and coverage. Contractor's obligation to indemnify shall not be restricted to insurance proceeds, if any, received by the Owner and the Engineer or their directors, officers, employees, agents and/or volunteers.

33. Separate Contracts

The Owner reserves the right to let other contracts in connection with this project. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his work with theirs. If the proper execution or results of any part of the Contractor's work depend upon the work of any other contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such work that render it unsuitable for such proper execution and results.

The Owner may perform additional work related to the project by himself, or he may let other contracts containing provisions similar to these. The Contractor will afford the contractors who are parties to such contracts (or the Owner, if he is performing the additional work himself), reasonable opportunity for the introduction and storage of materials and equipment and the execution of work, and shall properly connect and coordinate his work with theirs.

In the performance of additional work by other contractors or the Owner is not noted in the Contract Documents prior to the execution of the Agreement, written notice thereof shall be given to the Contractor prior to starting any such additional work. If the Contractor believes that the performance of such requires additional expense or entitles him to an extension of the contract time, he may make a claim therefore as provided in Items 19 and 20 of these General Provisions.

34. Subcontracting

The Contractor may utilize the services of specialty subcontractors on those parts of the work which, under normal contracting practices, are performed by specialty subcontractors.

The Contractor shall be fully responsible to the Owner for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by them, as he is of the acts and omissions of persons directly employed by him.

The Contractor shall cause appropriate provisions to be inserted in all contracts relative to the work to bind Subcontractors to the Contractor by the terms of the Contract Documents in so far as applicable to the work of Subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the Contract Documents.

Nothing contained in this contract shall create any contractual relation between any subcontractor and the Owner.

Contractor shall include all subcontractors as insured under its policies or shall furnish separate certificates and endorsements for each subcontractor. All coverage for Subcontractors shall be subject to all of the requirements stated herein.

35. Employment of Apprentices

The Contractor and any Subcontractor under him shall comply with the requirements of Sections 1777.5 and 1777.6 of the Labor Code in the employment of apprentices. The responsibility for compliance with the provisions of said Section 1777.5 for all apprenticeship occupations shall rest with the Contractor. Information relative to apprenticeship standards, wage schedules and other requirements may be obtained from the Division of Apprenticeship Standards, 455 Golden Gate Avenue, San Francisco, California, or from its branch offices.

36. Payment of Prevailing Wages

The Contractor and all Subcontractors under him shall pay all laborers, workmen and mechanics on all work included in this contract no less than the general prevailing rate of per diem wages for work performed, (to wit, within the limits of the City), and no less than the general prevailing rate of per diem wages for legal holiday and overtime work in said locality, which per diem wages shall not be less than the stipulated rate contained in a schedule thereof which has been ascertained and determined by the Council to be the general prevailing rate of per diem wages for each craft or type of workman or mechanic needed to execute this contract, and which is now on file with the City Clerk, as set forth in the Information for Bidders, and by reference it is incorporated herein and made a part hereof.

The Contractor shall forfeit, as a penalty to the Owner, two hundred dollars (\$200.00) for each laborer, workman or mechanic employed for each calendar day or portion thereof such laborer, workman or mechanic is paid less than the said stipulated rates for any work done under this contract by him or by any Subcontractor under him in violation of Articles 1 and 2 of Chapter 1 Part 7 of Division 11 of the Labor Code of the State of California, and said sums and amounts which shall have been so

forfeited pursuant to the herein paragraph and the said terms of said Labor Code shall be withheld and retained from payments due to the Contractor under said contract, pursuant to this contract and the said terms of said Labor Code; but no sum shall be so withheld, retained or forfeited except from the final payment without a full investigation by either the Division of Labor law Enforcement of the State Department of Industrial Relations or by said Council.

The difference between such stipulated prevailing wage rates and the amount paid to each workman for each calendar day, or a portion thereof, for which each workman was paid less than the stipulated prevailing wage rate shall be paid to each workman by the Contractor. The Contractor shall comply with the provisions of Section 1775 of the Labor Code of the State of California.

The Contractor and his subcontractors shall submit certified payroll information electronically to the Department of Industrial Relations as well as a hard copy of said certified payrolls to the Owner on a monthly basis.

37. Registration to Train Apprentices

Pursuant to Labor Code Section 1777.5, all contractors shall file with the appropriate Joint Apprenticeship Training Committee, a DAS-140 form registering to train apprentices. This requirement to register to train apprentices is mandated by Section 1777.5 whether or not you are signatory to or a party of any approved training program. Only those programs approved by the California Apprenticeship Council are applicable to accept DAS-140 registration forms.

If the contractor is approved to train apprentices, then apprentices must be called in a ratio not less than one apprentice hour for each five journeyman hours.

However, if the entire contract may be completed within 20 working days or the entire contract (or subcontracts) is less than thirty thousand dollars (\$30,000), then the Contractor is exempt from requesting apprentices under Labor Code Section 1777.5.

In addition, all contractors are required to make appropriate training contributions as set forth in the prevailing wage determination to each appropriate JATC, or in the alternative, to the California Apprenticeship Council. Payments shall be made not less than monthly, calculated and paid by the fifteenth of each month, for work performed that prior month.

The address for the applicable Joint Apprenticeship Training Committee and for the California Apprenticeship Council can be obtained by calling the Division of Apprenticeship Standards.

38. Penalties

Failure to pay the appropriate prevailing wage can result in penalties being assessed as follows:

- A. Up to \$50.00 per day per worker for each and every violation;
- B. debarment from future public works for a period not to exceed three years; and
- C. \$50.00 per day per worker for each failure to comply with the payment of overtime for all hours worked in excess of 8 in one day or 40 in one week.

Failure to register to train apprentices or failure to pay the appropriate training contribution can result in penalties being assessed as follows:

- A. \$100.00 per day for each day of violation; and,
- B. debarment from future public works for a period not to exceed three years.

39. Engineer's Authority

The Engineer shall act as the Owner's representative. He shall decide questions which may arise as to quality and acceptability of materials furnished and work performed. He shall interpret the intent of the Contract Documents in a fair and unbiased manner. The Engineer will make visits to the site and determine

if the work is proceeding in accordance with the Contract Documents.

The Contractor will be held strictly to the intent of the Contract Documents in regard to the quality of materials, workmanship and execution of the work. Inspections may be made at the factory or fabrication plant of the source of material supply.

The Engineer will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.

40. Land and Rights-of-Way

Prior to issuance of the Notice to Proceed, the Owner shall obtain all land and rights-of-way necessary for carrying out and for the completion of the work to be performed pursuant to the Contract Documents, unless otherwise mutually agreed.

The Owner shall provide to the Contractor information which delineates and describes the lands owned and rights-of-way acquired.

The Contractor shall provide, at his own expense and without liability to the Owner, any additional land and access thereto that the Contractor may desire for temporary construction facilities, or for storage of materials.

41. Warranty and Guarantee

Contractor warrants and guarantees to Owner that all work will be in accordance with the Contract Documents and will not be defective. Prompt notice of defects known to Owner shall be given to Contractor. All defective work, whether or not in place, may be rejected, corrected or accepted as provided in Paragraph 19, Changes in the Work, of these General Provisions. Defective work may be rejected even if approved by prior inspection.

42. One (1) Year Warranty Period

The warranty period shall commence when the Notice of Completion is issued, at notice of beneficial occupancy or at notice of partial utilization of the work to be warranted has been issued, or a later date if so specified in the Agreement, or mutually agreed to, and extend until one (1) year after that date or whatever longer period may be prescribed by laws or regulations or by the terms of any applicable special guarantee or specific provision of the Contract Documents.

43. Correction of Defective Work

If within the designated warranty period, or such longer period as may be required by Laws or Regulations, the work, or any part of the work, is discovered to be defective, Contractor shall promptly, without an adjustment in contract price and in accordance with Owner's written instructions, either correct that defective work, or if it has been rejected by Owner, remove it from the site and replace it with non-defective work. If circumstances warrant it, including but not limited to, in an emergency, Owner may have the defective work corrected or the rejected work removed and replaced. In that event, Contractor shall not be allowed to recover any associated costs, and he shall reimburse Owner for all direct, indirect and consequential costs of Owner, and Owner shall be entitled to an appropriate decrease in contract price, to withhold a set-off against amount recommended for payment, or make a claim on Contractor's bond if Contractor has been paid in full. Where defective work (and damage to other work resulting therefrom) has been corrected, removed or replaced during the warranty period, the one (1) year warranty period with respect to such work will be extended for an additional period of one (1) year after such correction or removal and replacement has been satisfactorily completed.

44. Early Completion

The one (1)-year warranty period will not begin until the Notice of Completion is filed. If Contractor completes the work or portions thereof prior to this time, he shall preserve the equipment and/or facilities by developing and implementing a preventive maintenance program in compliance with manufacturer's recommendations to maintain the equipment and/or facilities unless Owner has issued a notice of beneficial occupancy or notice of partial utilization for the warranted work. At start up, Contractor will be required to get his equipment and/or facilities ready to be put into service.

45. Extended Warranties and Guarantees

Owner may at its sole discretion extend the one (1)-year warranty period up to twenty-four (24) months, in which case Contractor shall maintain the warranties and guarantees. If such extension of the one (1)-year warranty period causes an increase in the cost of the warranties and guarantees provided by Contractor, an adjustment in contract price shall be made as provided by the Contract Documents.

46. Arbitration

With the prior approval of the Owner and the Contractor, all claims, disputes and other matters in question arising out of, or relation to, the Contract Documents or the breach thereof, except for claims which have been waived by the making and acceptance of final payment as provided by Item 27 of these General Provisions, may be decided by arbitration in accordance with the Arbitration Rules of the American Arbitration Association. If entered into, the agreement to arbitrate shall be specifically enforceable under the prevailing arbitration law. The award rendered by the arbitrators shall be final, and judgment may be entered upon it in any court having jurisdiction thereof.

Notice of the request for arbitration shall be filed in writing with the other party to the Contract Documents and with the American Arbitration Association, and a copy shall be filed with the Engineer. The request for arbitration shall set forth specifically the dispute to be arbitrated. Acceptance by the other party of the request to arbitrate shall constitute the agreement to arbitrate and arbitration shall proceed forthwith. No legal proceedings other than to enforce arbitration shall be commenced on any issue covered by the arbitration agreement.

The Contractor shall carry on the work and maintain the progress schedule during any arbitration proceedings, unless otherwise mutually agreed in writing.

47. Taxes

The Contractor shall pay all sales, consumer, use and other similar taxes required by the law of the place where the work is performed.

48. Contractor's Understanding

It is understood and agreed that the Contractor has, by careful examination, satisfied himself as to the nature and extent of the work, the character, quality, and quantity of the materials to be encountered, the character of the equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions, and all other matters which can in any way affect the work under this contract. No verbal agreement or conversation with any officer, agent or employee of the Engineer or the Owner, either before or after the execution of this Agreement, shall affect or modify any of the terms or obligations herein contained.

49. Accidents

The Contractor shall provide, at the site, such equipment and medical facilities as are necessary to supply first-aid service to anyone who may be injured in connection with the work. The Contractor must promptly report in writing to the Engineer all accidents whatsoever arising out of, or in connection with the performance of the work, whether on or adjacent to the site which causes death, personal injury, or property damages, giving full details and statements of witnesses. In addition, if death or serious injuries or serious

damages are caused, the accident shall be reported immediately by telephone or messenger to both the Engineer and the Owner. If any claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Engineer, giving full details of the claim.

50. Safety and Sanitation

The Contractor shall provide adequate safety and sanitation facilities according to State laws and local ordinances.

The Contractor will assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and equipment. This responsibility shall apply continuously and not be limited to normal working hours.

51. Climatic Conditions

The Engineer may order the Contractor to suspend any work that may be subject to damage by climatic conditions. The Contractor may suspend work if climatic conditions are such that the Contractor is unable to work. In such case, the Contractor, within seven days, shall request in writing a change order to extend the contract time.

52. Officials Not To Benefit

No official of the Owner shall receive any benefit that may arise by reason of this contract.

53. Clean-Up

During the progress of the work, the Contractor shall maintain the site and related structures and equipment in a clean, orderly condition and free from unsightly accumulations of rubbish. Upon completion of the work, the Contractor shall remove from the vicinity of the work all plants, buildings, rubbish, unused materials, concrete forms, temporary bridging, and other like material, belonging to him or used under his direction during construction, and in the event of his failure to do so, the same may be removed by the Owner after 10 calendar days notice to the Contractor at the expense of the Contractor, and his surety or sureties shall be liable therefore.

As part of the final clean-up, the Contractor shall dress up and grade the right-of-way to match existing ground surfaces and shall remove therefrom all weeds and other growth. Where the construction has crossed yards or driveways, they shall be restored to a condition equivalent to the condition existing prior to the construction as determined by the Engineer.

No direct payment will be made to the Contractor for any clean-up work, but all compensation therefore shall be included in the prices bid in the schedule for the various items of work.

54. Notice to Owner

In the event this contract involves digging trenches or excavations that extend deeper than four feet below the surface, the Contractor shall promptly, and before the following conditions are disturbed, notify Owner, in writing, of any:

- A. Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

- B. Subsurface or latent physical conditions at the site differing from those indicated.
- C. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract.

Owner shall promptly investigate the conditions. If Owner finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the work, Owner shall issue a change order under the procedures described in the contract.

In the event a dispute arises between Owner and Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the work, the Contractor, shall not be excused from any scheduled completion date provided for by the contract, but shall proceed with all work to be performed under the contract. The Contractor shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between Contractor and Owner.

55. Payment of Withheld Funds

The Owner shall retain 5% of each payment from Contractor and shall make prompt and regular incremental acceptances of portions, as determined by the Owner, of the agreed-upon work, and pay retention to the Contractor based on these acceptances. The Contractor, or Subcontractor, shall return all monies withheld in retention from a Subcontractor within 30 days after receiving payment for work satisfactorily completed and accepted including incremental acceptances of portions of the contract agreement work by the Owner. Federal law (49CFR26.29) requires that any delay or postponement of payment over 30 days may take place only for good cause and with the Owner's prior written approval. Any violation of this provision shall subject the violating Contractor or Subcontractor to the penalties, sanctions and other remedies specified in Section 7108.5 of the Business and Professions Code. These requirements shall not be construed to limit or impair any contractual, administrative, or judicial remedies otherwise available to the Contractor or Subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor, deficient Subcontract performance, or noncompliance. When the work is complete, the Owner will issue a Notice of Completion to the County. The Owner will pay all retention funds to the Contractor thirty-five (35) Days after Notice of Completion has been recorded.

56. Storm Water Pollution Prevention Measures

Storm Water Pollution Prevention Measures shall be performed in accordance with the provisions in Section 13-3, "Storm Water Pollution Prevention Plan," of the Caltrans Standard Specifications.

A. GENERAL

In compliance with the State and Federal regulations regarding stormwater management during construction, the Contractor shall not allow any debris, waste materials or pollutants originating from the Contractor's operations to enter the storm drainage system, which leads to contamination of local creeks and ponding basins.

The Contractor shall properly dispose of all wastes and excess materials in a legal manner to the satisfaction of the Owner.

B. SELECTIVE BMPS FOR STORM WATER POLLUTION PREVENTION

As applicable to the project or directed by the Engineer, the Contractor shall implement any or all of the following Best Management Practices (BMPs):

1. Material Handling and Storage

a. Nonhazardous Materials

i. Designated Delivery and Storage Area

The Contractor shall propose areas in the vicinity of or within the project site or within the Contractor's staging site, which are suitable for material delivery and storage. To the maximum extent practicable, these areas shall be away from gutters, catch basins, drainage courses or creeks. The Contractor shall submit the proposed areas to and shall obtain the approval from the Engineer in writing prior to bringing in materials.

ii. Storage of Granular Materials

The Contractor shall store granular materials at least ten feet (10') away from any inlet or curb return and shall prevent the granular materials from entering the storm drain system, drainage courses or creeks. During wet weather or when rain is forecast within 24 hours, the Contractor shall cover granular materials with a tarpaulin and surround the material with sandbags or other approved heavy objects.

b. Hazardous Materials

i. Hazardous materials include, but are not limited to, petroleum products, antifreeze, paints, thinners, solvents, pesticides, herbicides and various other toxic chemicals.

ii. The Contractor shall propose, within the project site or the Contractor's staging site, an area that is suitable for hazardous material delivery and storage. To the maximum extent practicable, the area shall be away from inlets, gutters, drainage courses or creeks. The Contractor shall submit the proposed area to and shall obtain approval from the Engineer in writing prior to bringing in hazardous materials.

iii. The Contractor shall label and store all hazardous materials and hazardous wastes in accordance with secondary containment regulations, the City of Los Banos Hazardous Materials Storage Ordinance, and all applicable Merced County, State and Federal laws and regulations.

iv. The Contractor shall keep all hazardous materials or waste in containers and fully covered to avoid contamination of storm runoff.

v. The Contractor shall keep an accurate, up-to-date inventory, including Safety Data Sheet (SDS), of hazardous materials and hazardous wastes stored onsite to assist emergency response personnel in the event of a hazardous material incident.

2. Hazardous Material Usage

a. The Contractor shall follow all local, State and Federal policies, laws and regulations governing the use of hazardous materials.

b. The Contractor shall use only Category III pesticides for pest control. If Category III pesticides are unavailable, have been tried but proven ineffective, or when it is necessary to prevent a pest outbreak that poses an immediate threat to public health or significant economic loss, the City may consider allowing the use of Category II pesticides with a dose of up to LD50 (a dose that kills 50% of the targeted pest population in the laboratory) provided that the risk to the applicator and impact to the environment can be justified. Use of Category I pesticides is prohibited.

c. Apply pesticides at the appropriate time to maximize their effectiveness

and minimize the likelihood of discharging non-degraded pesticides into stormwater system, drainage courses and creeks.

d. Mix only as much material as is necessary for treatment. Calibrate application equipment prior to and during use to ensure desired application rate. Do not mix or load pesticides adjacent to storm drain system, drainage courses or creeks.

e. The Contractor shall not overapply herbicides, pesticides or fertilizers and shall follow the manufacturer's instructions regarding uses, protective equipment, ventilation, flammability and mixing of chemicals. Overapplication of a pesticide is a "label violation" subject to an enforcement action by the Merced County Agriculture Department.

f. When rain is forecast within 24 hours or during wet weather, the Contractor shall not apply chemicals in outside areas unless otherwise allowed by the Engineer in writing.

3. Integrated Pest Management Methods

The Contractor shall employ, in place of pesticides, integrated pest management methods including:

- a. No control
- b. Physical or mechanical methods
- c. Least toxic chemicals (insecticidal soaps and oil, etc.)

4. Vehicle and Equipment Cleaning, Maintenance and Fueling

a. Cleaning

The Contractor shall not clean or wash vehicles or equipment onsite or in the streets. If allowed by the Engineer in writing, cleaning and washing shall be performed in a designated and bermed area approved by the Engineer using water only. No soaps, solvents, degreasers, steam-cleaning equipment or similar methods are permitted. The Contractor shall not allow wash water to flow into streets, gutters, storm drain system, drainage courses or creeks.

b. Maintenance and Fueling

i. The Contractor shall perform maintenance and fueling of vehicles or equipment in a designated, bermed area or over a drip pan that will prevent waste, leaks or spills from entering streets, gutters, storm drain system, drainage courses or creeks.

ii. The Contractor shall inspect all vehicles and equipment arriving onsite for leaking fluids and shall promptly repair leaking vehicles and equipment. Drip pans shall be used to catch leaks until repairs can be made. Shut-off valves on equipment must be working properly.

5. Spill Prevention and Control

a. If hazardous materials are used on the project, the Contractor shall keep a stockpile of spill cleanup materials, such as rags or absorbents, readily accessible on-site.

b. Above-ground storage tanks and their installations shall comply with City, State and Federal requirements.

c. The Contractor shall immediately contain and prevent spills or leaks from entering storm drain system, drainage courses or creeks and shall properly clean up and dispose of the spills or leaks. The Contractor shall not wash the spills or

leaks into streets, gutters, storm drain system, drainage courses or creeks and shall not bury the spills or leaks.

d. In case of a hazardous material spillage, the Contractor shall immediately call 911 and shall handle the spilled material in accordance with the requirements of 6, "Disposal of Hazardous Waste," below.

6. Disposal of Hazardous Waste

a. Unless the Contractor is a licensed hazardous waste handler, the Contractor shall contract with a licensed hazardous waste handler to remove and dispose of hazardous waste materials unless the waste quantities to be transported are below threshold limits for transportation as specified in the State and Federal regulations.

b. The Contractor shall arrange for regular hazardous waste collection to comply with limits for storage of hazardous waste.

c. The Contractor may dispose of dry, empty paint cans, buckets, paintbrushes, rollers, rags and drop cloths in the trash.

d. The Contractor shall dispose of hazardous waste at facilities authorized for treatment, storage and disposal of hazardous waste only.

7. Street Sweeping

At the end of each day or as directed by the Engineer, the Contractor shall sweep roadways of all debris and excess materials attributed to the Contractor's operations.

8. Water Usage

a. The Contractor shall use the least amount of water necessary for dust control and street sweeping operations.

b. The Contractor shall not use water to flush dust and debris down the street in place of street sweeping.

9. Dumpsters and Portable Sanitary Facilities

a. If dumpsters or portable sanitary facilities are used, they shall be stationed at least ten feet (10') away from storm drain facilities.

b. The Contractor shall arrange for regular waste collection to keep dumpsters and portable sanitary facilities from overflowing and shall regularly inspect these facilities for leaks. If a leak is discovered, the Contractor shall arrange for the repair or replacement of facilities that leak. The Contractor shall not wash the dumpsters or portable sanitary facilities onsite.

10. Earthwork

The Contractor shall maximize the control of erosion and sediment by using the Best Management Practices for erosion and sedimentation control described in the California Storm Water Best Management Practice Handbook - Construction Activity or ABAG Manual of Standards for Erosion and Sediment Control Measures.

11. Dewatering

a. The Contractor shall route water through a control device, such as a sediment trap, sediment basin or Baker tank, to remove settleable solids prior to discharging the water into the storm drain system. Refer to the California Storm Water Management Practice Handbook for these sediment control measures.

b. Approval of the control device shall be obtained in advance from the Engineer.

- c. Filtration of the water following the control device may be required on a case-by-case basis.
- d. If the Engineer determines that the dewatering operation would not generate an appreciable amount of settleable solids, the control device may be waived.

12. Saw Cutting

- a. During saw cutting or grinding operation, use as little water as possible.
- b. During saw cutting, the Contractor shall cover or barricade catch basins using filter fabric, straw bales, sandbags or fine gravel dams to keep slurry out of the storm drain system. When protecting a catch basin, the Contractor shall ensure that the entire opening of the catch basin is covered. Refer to California Storm Water Best Management Practice Handbook for these control measures.
- c. The Contractor shall shovel, absorb or vacuum saw cut slurry and pick up the waste as the Work progresses prior to moving to the next location, as specified elsewhere in these specifications or as directed by the Engineer.
- d. If saw cut slurry enters catch basins, the Contractor shall, at the Contractor's cost, clean up the storm drain system immediately.

13. Concrete, Grout and Mortar Related Work

- a. Material Handling
 - i. The Contractor shall avoid mixing excess amounts of fresh concrete or cement mortar on-site.
 - ii. The Contractor shall store concrete, grout and mortar away from storm drain facilities or drainage courses and shall ensure that these materials do not enter the storm drain system.
- b. Washing of Concrete Truck and Tools
 - i. The Contractor shall not wash out concrete trucks or equipment into streets, gutters, storm drain system, drainage courses or creeks.
 - ii. The Contractor shall perform washing of concrete trucks and tools offsite or in a designated area onsite where the water will flow onto dirt or into a temporary pit in a dirt area. The Contractor shall let the water percolate into the soil and dispose of the hardened concrete in a trash container. If a suitable dirt area is not available, the Contractor shall collect the wash water and dispose of it offsite.

14. Asphalt Concrete Paving

- a. Project Site Management
 - i. When rain is forecast within 24 hours or during wet weather, the Engineer may prevent the Contractor from paving.
 - ii. The Engineer may direct the Contractor to protect drainage courses by using earth dike, straw wattle or sandbag to trap and filter sediment. Refer to California Storm Water Best Management Practice Handbook for these control measures.
 - iii. The Contractor shall place drip pans or absorbent material under paving equipment when not in use.
 - iv. The Contractor shall cover catch basins and manholes when paving or applying prime coat, tack coat, seal coat, fog seal or slurry seal.

v. If the paving operation includes an onsite mixing plant, the Contractor shall comply with Merced County NPDES General Industrial Activities Storm Water Permit requirements.

vi. The Contractor shall preheat, transfer or load hot bituminous material away from storm drain system, drainage courses or creeks.

b. Paving Waste Management

The Contractor shall not sweep or wash down excess sand (placed as part of a sand seal or to absorb excess oil) into streets, gutters, storm drain system or creeks but shall collect the sand and dispose of it offsite. The Contractor shall not wash fresh asphalt concrete pavement.

15. Painting

a. General

i. The Contractor shall remove as much excess paint as possible from brushes, rollers and other tools before starting cleanup.

ii. The Contractor shall conduct cleaning of painting equipment and tools in a designated area approved by the Engineer.

iii. The Contractor shall not allow wash water from cleaning of painting equipment and tools into streets, gutters, storm drain system, drainage courses or creeks.

b. Water-Based Paint

To the maximum extent practicable, the Contractor shall dispose of wash water from water cleaning of brushes, rollers and other tools used in water-based painting work to the sanitary sewer or direct wash water onto dirt area and spade in.

c. Oil-Based Paint

The Contractor shall dispose of waste thinner and solvent and sludge from cleaning of brushes, rollers and other tools used in oil-based painting work as hazardous waste and the Contractor shall handle the waste as described in Section 6, "Disposal of Hazardous Waste," above. To the maximum extent practicable, the Contractor shall filter paint thinner and solvents for reuse.

16. Thermoplastic

a. The Contractor shall transfer and load hot thermoplastic away from drainage systems or drainage courses or creeks.

b. The Contractor shall sweep thermoplastic grindings into plastic bags. Yellow thermoplastic grindings may require special handling as they may contain paint.

C. CONTRACTOR TRAINING AND AWARENESS

1. The Contractor shall train all employees and Subcontractors on the storm water pollution prevention requirements contained in these specifications.

2. The Contractor shall inform Subcontractors of the storm water pollution prevention contract requirements and include appropriate subcontract provisions to ensure that these requirements are met.

3. The Contractor shall post warning signs in areas treated with chemicals.

D. BMP IMPLEMENTATION

The Contractor shall be responsible throughout the duration of the construction period for installing and maintaining the applicable BMPs and for removing and legally disposing of temporary control measures. Unless otherwise directed by the Engineer or specified elsewhere in these specifications, the Contractor's responsibility for BMP implementation shall continue throughout any temporary suspension of work ordered in conformance with the provisions in Section 8-1.06, "Suspensions," of the Caltrans Standard Specifications.

Throughout the rainy season, all soil-disturbed areas of the site shall be fully protected with soil stabilization and sediment control device approved by the Engineer at the end of the same day the soil is disturbed unless fair weather is predicted the next day and the protective measures are exempt by the Engineer. The Contractor shall monitor the weather forecast on a daily basis and inform the Engineer of the forecast. The National Weather Service forecast shall be used for this purpose. If precipitation is predicted for the following day, construction schedule shall be altered as required to install appropriate BMPs or to ensure that the already- installed BMPs are in good operating condition prior to the onset of rain.

BMP MAINTENANCE

To ensure proper implementation and effectiveness of the BMPs, the Contractor shall regularly inspect and maintain the deployed BMPs throughout the construction site. The Contractor shall identify corrective actions and the time needed to address any deficient BMPs or reinstate any BMPs that have been discontinued. The Contractor shall keep written records of all BMP inspections, maintenance, and corrective actions.

The frequency of the BMP inspection shall be as follows:

1. Prior to a forecast storm;
2. After any precipitation that causes runoff;
3. At 24-hour intervals during extended rain events; and
4. Routinely, at a minimum of once every week.

If the Contractor or the Engineer identifies a deficiency in the deployment or functioning of a BMP, the deficiency shall be corrected immediately. If requested by the Contractor and approved by the Engineer in writing, the deficiency may be corrected at a later time or date but the corrective action shall not be later than the onset of the subsequent rain event. The correction of deficient BMPs shall be at no additional cost to the City.

E. RESPONSIBILITIES, CONSEQUENCES, AND REMEDIES

1. Conformance with the provisions of this section or other requirements in various other sections of these specifications shall not relieve the Contractor from the Contractor's responsibilities as provided in various relevant articles of Section 7, "Legal Relations and Responsibilities to the Public," of the Standard Specifications, and as specified herein.
2. For purposes of this section, costs and liabilities include, but are not limited to, fines, penalties and damages, whether assessed against the City or the Contractor, including those levied under the Federal Clean Water Act and the State Porter-Cologne Water Act.
3. If solid or liquid materials or waste, hazardous or otherwise, or pollutants originating from the Contractor's operation enter the storm drain system or water courses, the Contractor will be required to thoroughly clean up the affected storm drain facilities and water courses to the satisfaction of the Engineer. If the Contractor fails to clean up the affected facilities as required, the City will issue a stop-work order and take necessary actions to effect the cleanup of the affected facilities.

4. The Contractor shall be responsible for all costs, including fines, the City's cost of defense, the cost of cleanup by others ordered by the City, and liabilities imposed by law as a result of the Contractor's failure or negligence in complying with the requirements specified herein.
5. In accordance with the provisions of Section 7-1.05, "Indemnification," of the standard Caltrans Standard Specifications if the Contractor fails to accept or reject a tender of defense and indemnity within fifteen (15) calendar days, the City may, in addition to the remedies authorized by law, retain any sum due the Contractor until disposition has been made of all claims or suits for damages or until the Contractor accepts or rejects the tender of defense, whichever occurs first.

F. PAYMENT

Full compensation for storm water pollution control shall be considered as included in the payment for various other items of work and no additional compensation will be made therefore.

END OF SECTION

Special Provisions

1. Requirements

It is required that there be constructed and completed in accordance with the Contract Documents for "Construction of Los Banos Police Department Gun Range for the City of Los Banos, all work as described in these Contract Documents.

2. Description of Work

The principal components of the work to be performed under these Contract Documents include the following:

The major work consists of but is not limited to: demolition and site preparation; concrete & aggregate base hardscape; site furnishing installation (including modular restroom, septic tank, water tank, shade structure, etc.); and other site work.

All work shall be performed in accordance with applicable City standards, manufacturer guidelines, and regulatory requirements.

Any incidental work not described in the Contract Documents which is necessary to complete the Work shall be furnished and installed as part of this contract at no additional cost to the Owner. The work shall be complete and ready for service to the satisfaction of the Owner. The Contractor shall have had the opportunity to inspect the site and observe actual working conditions during the mandatory pre-bid meeting.

3. Commencement, Prosecution and Completion of Work

The Contractor shall commence work and shall complete all of the work in accordance with the schedule and within the time stated in the bid. The capacity of the Contractor's construction plant, sequence of operations, method of operations, and the forces employed shall at all times during the continuance of the contract be subject to the approval of the Engineer and shall be such as to ensure the completion of the work within the time specified.

4. Hours of Work

Construction work shall be completed between the hours of 7:00 a.m. and 5:00 p.m. Monday through Friday using normal construction practices. No work shall be performed on Saturday or Sunday. The Contractor may request to the Owner to perform construction outside of these specified hours.

5. City Permits and Business Licenses

The Contractor will need an Encroachment Permit from the Public Works Department prior to start of construction. The Contractor and all Subcontractors working within the city limits of Los Banos shall apply for and have issued a business license from the City of Los Banos (209-827-7000) prior to commencement of work.

6. Testing

Disinfection testing of the new water meters shall be in accordance with AWWA C651. Water meters shall be swabbed with chlorine and flushed and then tested. All testing shall be performed by a laboratory retained by the Contractor and approved by the Owner. All disinfection testing and reporting shall be borne by the Contractor.

New facilities shall be kept isolated from the active distribution system prior to disinfection and acceptance.

Submittals

Submit each compliance report to the Engineer. Reports shall include the following information:

Disinfection report; accurately record:

Type and form of disinfectant used.

Date and time of disinfectant injection start and time of completion.

Test locations.

Initial and 24-hour disinfectant residuals in parts per million (ppm) for each location tested.

Date and time of flushing start and completion.

Disinfectant residual after flushing in ppm for each location tested.

Persons present during the disinfection operation.

Bacteriological report; accurately record:

Date issued, project name, and testing laboratory name, address, and telephone number.

Time and date of water sample collection.

Name of person collecting samples.

Test locations.

Initial and 24-hour disinfectant residuals in ppm for each location tested.

Coliform bacteria test results for each location tested.

Certification that water conforms, or fails to conform, to bacterial standards of the California State Water Resources Control Board.

Bacteriologist's signature.

Quality Assurance

Testing laboratory shall be certified with the State of California for examination of drinking water and shall be selected by the Contractor and approved by the Owner. All samples shall be gathered and tested by said Laboratory.

Contractor shall instruct the testing laboratory to provide the test results to the Engineer immediately upon results and a copy of the written report sent directly to the Engineer.

Products

All disinfectant chemicals shall be certified to ANSI/NSF Standard 60 and shall be either Calcium hypochlorite (comparable to commercial products known for example as HTH, Perchloron, and Pittchlor, sold for swimming pool chlorination) or Sodium hypochlorite (liquid bleach, sodium hypochlorite in powder or tablet form for pool chlorination).

Chlorinating water services: Water meters and services lines can be sprayed or swabbed with chlorine per AWWA C651, Section 5.5.3.1.

Circulate and flush repeatedly until specified cleanliness is achieved. Before being placed in service, all new mains and repaired portions of, or extensions to, existing mains shall be chlorinated so that a chlorine residual of not less than 25 mg/l free available chlorine remains in the water after 24 hours standing in the pipe. Disposal of flushed chlorinated water shall be at the responsibility of the Contractor. If Contractor chooses to flush water in the local storm drain system, water shall be dechlorinated as described in AWWA C655.

Tests

Samples shall be tested in accordance with ANSI/AWWA C651 for water mains and water services.

Test shall be taken no more than 10 days prior to the system being placed into service.

If disinfection fails to produce satisfactory test results, the new pipes and facilities may be re-flushed and retested. If samples taken after re-flushing also fail to produce satisfactory results, sections represented by those results shall again be disinfected and retested. The cost of any retests, including time for the Engineer, shall be borne by the Contractor at no additional cost to the project.

7. Responsibility Regarding Existing Utilities and Private Property

The existence and location of public and private utilities indicated on the drawings are not guaranteed and any additional utilities and facilities not shown on the drawings shall be investigated and protected by the Contractor. The Contractor shall be held responsible for damage to and for maintenance and protection of existing pipelines, public utilities, drives, curbs and gutters, sidewalks, and fences. Excavation in the vicinity of existing public utility structures, underground electrical or telephone cable, oil or gas pipelines, and waterlines shall be carefully done by hand. The Contractor shall adequately protect all adjoining property and structures from damage, whether within or without of the Owner-furnished rights-of-way, and shall be fully responsible for any damage to adjoining property and structures which may result from work done under this Agreement. The Contractor shall use extreme care during construction to prevent damage from dust to crops and adjacent property. The Contractor shall sprinkle the areas where the passage of operation of vehicles and equipment creates a dust problem, or take other preventive measures as directed by the Engineer. The Contractor shall furnish all labor, equipment, materials and means required to control dust which is in any way a result of the Contractor's operations.

The Contractor shall be responsible for all damage or injury which may result to any property, outside of the construction right-of-way or within the right-of-way where so noted, from the Contractor's operations hereunder, or otherwise, from the performance of the Agreement by said Contractor or any of his Subcontractors or employees.

The Contractor shall attempt to maintain access to the residential and commercial driveways within the construction area at all times during working hours and shall provide access during non-working hours, weekends and holidays.

Payment for all work specified above shall be included in the unit or lump sum prices bid in the schedule for the various items of work.

8. Obstructions

The Contractor shall notify the Engineer and the appropriate regional notification center for operators of subsurface installation at least 3 working days, but not more than 14 calendar days, prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Failure to contact the notification center prohibits excavation. Regional notification centers include but are not limited to the following:

NOTIFICATION CENTER

Underground Service Alert
Northern California (USA)
www.usanorth811.org

TELEPHONE

811 or
1-800-227-2600

9. Materials Furnished By Owner

10. Materials Furnished By Contractor

Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation, and other facilities necessary for the execution and completion of the work.

11. Schedule of Values, Material List and Substitutions

Prior to the commencement of work, and within 10 days following the signing of the contract by the Owner and the Contractor, the Contractor shall submit 2 copies of a Schedule of Values for all lump sum bid items in the Bid Schedule and a *complete* list of equipment and materials to be furnished, including all substitutions proposed to the Engineer for approval. Partial or incomplete material lists will not be considered. No substitutions will be considered thereafter. Only one request for substitution will be considered for each item of material or equipment.

12. Request for Extension of Time

All extension-of-time requests shall be made in writing to the Engineer within seven (7) calendar days from the delay occurrence date. In the case of a continuing cause of delay, only one claim is necessary.

13. Rights-of-Way

The Contractor shall not be entitled to extra compensation for hardships and increased cost caused by the work being adjacent to telephone-telegraph lines and guy wires, power lines and guy wires, buildings, fences, pipelines, ditches, roadways, and other obstacles which may physically restrict or limit the use of construction equipment. In some cases, such physical confinement may necessitate special methods of construction of the work. If the Contractor desires to utilize additional area, he shall obtain the necessary approvals from the landowner. No additional compensation shall be paid to the Contractor for the cost of obtaining additional right-of-way or for the inability to obtain such.

14. Coordination with Other Work

Other work including but not necessarily restricted to relocation of power and telephone poles, installation of a gas line and relocation of water meters may be in progress near or at the construction site at the time the Contractor is in performance of the work specified herein. The Contractor shall coordinate his work with that of others so that prosecution of all work will proceed smoothly.

15. Closure of Streets

The Contractor will be allowed to temporarily close the streets being paved to vehicular traffic between the hours 7:00 a.m. and 5:00 p.m. on the day the streets are being paved. All street closure dates shall be coordinated with and approved by the Engineer for approval no later than 10 working days prior to the earliest proposed closures and detours.

16. Construction Signs, Barricades, Lights and Flagmen

The Contractor shall furnish, erect and maintain adequate barricades, lights, signs and other devices and take other protective measures to prevent damage to the public. The Contractor shall also furnish adequate warning to the public of dangerous conditions to be encountered. Where one lane of a public road is closed, the Contractor shall furnish flagmen at each end of the closed lane to control traffic in the open lane. The Contractor shall also furnish adequate warning to the public of dangerous conditions to be encountered.

Payment for traffic control and other safety measures shall be included in the Traffic Control Plan lump sum

price bid in the Bid Schedule.

17. Traffic Control Plan

It is the Contractor's sole responsibility to establish and implement a Traffic Control Plan conforming to Sections 7-1.08, "Public Convenience" 7-1.09, "Public Safety", and Section 12, "Construction Area Traffic Control Devices", of the Caltrans Standard Specifications. Nothing in these Contract Documents shall be construed as relieving the Contractor from his responsibility.

The Traffic Control Plan shall be prepared, stamped and signed by a professional engineer registered in California, and three copies provided to the Engineer before the Contractor is issued a Notice to Proceed.

Payment for the preparation and implementation of the Traffic Control Plan shall be made at the applicable lump sum price bid in the Bid Schedule.

18. Disposal of Waste Materials

Waste material shall be disposed of in accordance with local regulatory requirements. Provide watertight conveyance for liquid, semi-liquid or saturated solids which tend to bleed during transport. Liquid loss from transported materials is not permitted, whether being delivered to construction site or hauled away for disposal. Fluid materials hauled for disposal must be specifically acceptable at selected disposal site.

19. Noise Control

Conduct operations to cause least annoyance to residents in vicinity of work, and comply with applicable local ordinances. Equip compressors, hoists, and other apparatus with mechanical devices necessary to minimize noise and dust. Equip compressors with silencers on intake lines. Equip gasoline or oil-operated equipment with silencers or mufflers on intake and exhaust lines.

20. Water Supply

Water will be available to the Contractor in performance of the work without charge from all Owner fire hydrants. Prior to the use of any hydrant the Contractor shall notify the Owner and obtain and install a meter furnished by the Public Works Department on the fire hydrant. It will be the Contractor's responsibility to convey the water to the work site. Regardless of the method of conveyance chosen, it shall not be cause for closure of any streets nor shall it create a nuisance to nearby residents. An air gap shall be maintained between the hose or pipe discharge to prevent possible backflow in the event of distribution system pressure loss. The Contractor shall pay a One-Thousand Dollar (\$1,000) deposit per meter for the use of the fire hydrant meter. The deposit may be refunded in full if the fire hydrant meter is returned undamaged.

21. Notifications

The Owner will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Owner, of any non-compliance with State or local requirements. The Contractor shall, after receipt of such notice from the Owner or from the regulatory agency through the Owner, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

During temporary water service shutdown, no single water service shall be disrupted for more than 4 hours, and each notification to affected residents shall be as follows:

1. Notice shall read: "Due to the current City of Los Banos Water Meter Replacement Project, water will be shut down between the hours to (time) on the date of _____. Contact (Contractor's name and phone number) and the City of Los Banos for further questions and concerns."
2. Notifications shall be provided to existing connections at least 48 hours prior to the scheduled disruption of service.

22. Work Not Listed in Proposal

It is the intent of the plans, specifications and contract documents to provide for the construction of completed and finished facilities and works of improvement unless otherwise specifically provided. Except for authorized changes in the work, payment for said complete and finished facilities and works of improvement will be made only on the basis of the contract items of work listed in the proposal. All other work, including the furnishing of plants, labor, materials, tools, equipment, and incidentals, provided for in the plans, specifications and contract documents, or required for the proper completion of the work as a whole, for which no separate payment has been provided shall be a supplementary obligation of the Contractor and payment therefore shall be considered included in the prices paid for the various contract items of work listed in the proposal.

23. Submittals

The Contractor shall submit to the Engineer, a minimum of six sets, hard copies, or one electronic copy of the following submittals for review and approval:

1. All required permits
2. Disinfection Reports
3. Concrete and Foundation/Structural Mix
4. 4-Stall Modular Restroom
5. Preliminary Leach Field
6. Water Tank
7. Septic Tank
8. Piping, fittings, and jointing methods
9. 16'x30' Shade Structure and footings
10. 4" Depth Aggregate Base Rock

Within 10 days after the effective date of the Agreement and before starting to perform any work, the Contractor shall submit to the Engineer for review and approval:

1. A work schedule indicating the times for starting and completing the various stages of the work. No progress payment shall be made to Contractor until an acceptable schedule has been submitted to the Engineer.
2. Notification to Residents in English and Spanish as described in Section 21.
3. A Schedule of Values - a breakdown of each lump sum price to be used to determine deductive change orders, if necessary.
4. A complete list of equipment and materials to be furnished
5. City of Los Banos Business License for Contractor and all subcontractors

If more than TWO submittals for a single item are required because of incorrect or insufficient data, or the submittal is unacceptable, or because the Contractor wishes to change previously approved material, then all costs incurred by the Owner for the additional review shall be deducted from monies due the Contractor.

A revised work schedule shall be submitted within 5 days of request by the Engineer. No future progress payments shall be made to Contractor until an acceptable schedule has been submitted to Engineer.

24. Bid Item Descriptions

Bid Item A1– Grading (Rough / Fine)

The lump sum bid for this item shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals; for doing all work involved in site grading (rough & fine), as specified in the Plans and per Specification Section 312000 – Earth Moving. Excess material is property of the contractor and there will be no additional cost for off haul.

Bid Item A2- Temporary Erosion & Sediment Control

The lump sum price bid for this item shall include all costs for purchase, delivery, installation, and erosion control measures and BMPs as indicated on the Drawings and required by the SWPPP. The item also includes labor, equipment, materials, tools, equipment, and incidentals and for doing all the work required by the Drawings and Specifications which is not specifically set forth in the Bid Form as a pay item.

Bid Item B1 - 4” Concrete Flatwork (Site Finish ‘C’)

The square foot price bid for this item shall include all costs for purchase, delivery, installation, soil preparation, sub-grade material and compaction, concrete additives and sealers, surface treatments, stamping equipment, finishing, joints, and joint sealants in the areas indicated on the Drawings. The item also includes labor, equipment, materials, and all other work required by the Drawings and Specifications which is not specifically set forth in the Bid Form as a pay item.

Bid Item B2 - 6” Concrete Flatwork (Site Finish ‘D’)

The square foot price bid for this item shall include all costs for purchase, delivery, installation, soil preparation, sub-grade material and compaction, concrete additives and sealers, surface treatments, stamping equipment, finishing, joints, and joint sealants in the areas indicated on the Drawings. The item also includes labor, equipment, materials, and all other work required by the Drawings and Specifications which is not specifically set forth in the Bid Form as a pay item.

Bid Item B3 - 4” Thick Aggregate Base Rock (Site Finish ‘E’)

The unit price bid for this item shall include all costs for purchase, installation of aggregate base, in the areas indicated on the Drawings. The item also includes labor, materials and all other work required by the Drawings and Specifications which is not specifically set forth in the Bid Form as a pay item.

Bid Item C1 - 16’x30’ Shade Structure (Site Feature ‘8’)

The lump sum price bid for this item shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals; for doing all work involved procurement and installation of a 16’ x 30’ shade

structure, including coordinating ordering, fabrication, and shipment of all materials needed and installation of shade structure including hardware and concrete footings per manufacturer's recommendations, as specified in the Specifications and Plans. Contractor shall also be responsible for coordinating the structural engineering package with the City prior to installation and securing applicable building permit(s) which is not specifically set forth in the Bid Form as a pay item.

Bid Item C2 – 4-Stall Modular Restroom (Site Feature '4')

The lump sum bid price for this item shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals necessary to procure, deliver, install, and make operational a prefabricated modular restroom building. Work shall include, but not be limited to, coordinating the ordering, fabrication, delivery, and installation of the modular restroom in accordance with the manufacturer's recommendations; all required site work; foundation preparation; utility connections; testing; startup; and all appurtenant work necessary to provide a complete and fully operational facility, as specified in the Specifications and Plans. Contractor shall also be responsible for coordinating the structural engineering package with the City prior to installation and securing applicable building permit(s) which is not specifically set forth in the Bid Form as a pay item.

Bid Item D1 - Electrical Systems Improvements

The lump sum price bid for this item shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals; for doing all work involved in procurement and installation of all electrical on the project, including utility infrastructure, new electrical service, service to the restroom building, all site conduit pathways and wiring, all site lighting not attached to a new building covered under another bid item, and other amenities requiring electrical connections within the park for a fully functioning electrical system, as specified in the Plans and per Specification Divisions 26.

Bid Item D2 – Septic and Water System Improvements

The lump sum price bid for this item shall include full compensation for all labor, materials, tools, equipment, transportation, services, and incidentals required to furnish, install, test, and place into operation a complete onsite potable water supply system and Onsite Wastewater Treatment System (OWTS) serving the modular restroom facility, in accordance with the Drawings, Specifications, City of Los Banos Improvement Standards, and the Merced County Environmental Health Department OWTS permit.

Work includes furnishing and installing a 5,000-gallon aboveground polyethylene potable water storage tank with all required appurtenances, reinforced concrete foundation pad, seismic anchorage, submersible mixer, low-level float switch, packaged booster pump station, potable water piping, valves, fittings, tracer wire, interlock wiring, alarm indicator, and all associated electrical connections, together with hydrostatic testing, disinfection, and bacteriological testing of the potable water system.

Work also includes furnishing and installing gravity sanitary sewer collection piping with fittings and cleanouts, a 1,500-gallon two-compartment septic tank with effluent filter, risers, lids, and anti-flotation anchoring, a simplex effluent pump station with wet well, pump, controls, alarm, piping, valving, and access cover, force main, distribution box, and mounded subsurface leach field with perforated pipe, drain rock, geotextile fabric, and earthen cover mound, complete and operational.

The item shall also include all excavation, dewatering, trenching, bedding, backfill, compaction, surface restoration, startup, commissioning, permits, inspections, utility coordination, manufacturer-required installation procedures, structural engineering submittals (stamped by a licensed structural engineer), and coordination with all applicable regulatory agencies, including required inspection notice prior to backfilling OWTS components.

The lump sum price bid shall also include all work shown on the Drawings, specified in the Specifications, and otherwise required to complete the systems, whether or not specifically identified in the Bid Form as a separate pay item.

Bid Item E1 – Mobilization & Demobilization (NTE 5%)

Mobilization/ Demobilization will be paid for on a lump sum basis and is limited to 5% maximum of the total bid cost. The lump sum bid for this item shall include full compensation for conforming to these requirements, furnishing all the fees, traffic control plan, dust control plan, temporary fencing, tree protection, cleaning and washing down, labor, materials, tools, equipment, incidentals and for doing all the work involved in moving on and off the project site necessary for completion of the work.

Payment for 50 percent of Mobilization/ Demobilization/ Erosion Control or 2.5% of Total Base Bid, whichever is less, shall be made at the time of the first progress payment after the Contractor has purchased bonds and insurance. The remaining amount shall be made at the time of the final progress payment.

Bid Item E2 – Bonding and General Conditions (NTE 3%)

The contract lump sum price shall include full costs for bonding.

END OF SECTION

Technical Provisions

TECHNICAL SPECIFICATIONS FOR:

LOS BANOS POLICE DEPARTMENT GUN RANGE

July, 2026

100% SUBMITTAL



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SECTION 012500

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. The Work of This Section Includes: Administrative and procedural requirements for substitutions.

1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or City that are not required to meet other Project requirements but may offer advantage to Contractor or City.

1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use form acceptable to City and/or Landscape Architect.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by City and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.

- f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of City's.
 - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. City and/or Landscape Architect's Action: If necessary, Landscape Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. City and/or Landscape Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if City and/or Landscape Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

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

1.5 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

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

1. Conditions: City and/or Landscape Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, City and/or Landscape Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals from authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience:

1. Not allowed unless otherwise indicated.
2. City and/or Landscape Architect will consider requests for substitution if received within 60 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of City and/or Landscape Architect.
 - a. Conditions: City and/or Landscape Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, City and/or Landscape Architect will return requests without action, except to record noncompliance with these requirements:
 - 1) Requested substitution offers City a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities City must assume. City's additional responsibilities may include compensation to Landscape Architect for redesign and evaluation services, increased cost of other construction by City, and similar considerations.
 - 2) Requested substitution does not require extensive revisions to the Contract Documents.
 - 3) Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - 4) Substitution request is fully documented and properly submitted.
 - 5) Requested substitution will not adversely affect Contractor's construction schedule.
 - 6) Requested substitution has received necessary approvals from authorities having jurisdiction.
 - 7) Requested substitution is compatible with other portions of the Work.
 - 8) Requested substitution has been coordinated with other portions of the Work.
 - 9) Requested substitution provides specified warranty.
 - 10) If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is

uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013100
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. The Work of this Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Digital project management procedures.
 - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

- A. RFI: Request for Information. Request from City, Landscape Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within **15** days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in Project meeting room, in temporary field office. Keep list current at all times.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for City and/or Landscape Architect and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.

1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
 - 1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

- b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to City and/or Landscape Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
 - 1. File Preparation Format:
 - a. Same digital data software program, version, and operating system as original Drawings.
 - 2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format and PDF format.
 - 3. City and/or Landscape Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. City and/or Landscape Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: Drawings are available in CAD.
 - c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to City and/or Landscape Architect.

1.6 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. City and/or Landscape Architect will return without response those RFIs submitted to City and/or Landscape Architect by other entities controlled by Contractor.
 - 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
 2. City name.
 3. City's Project number.
 4. Date.
 5. Name of Contractor.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to City and/or Landscape Architect.
1. Attachments shall be electronic files in PDF format.
- D. Action: City and/or Landscape Architect will review each RFI, determine action required, and respond. Allow seven days for City and/or Landscape Architect's response for each RFI. RFIs received by City and/or Landscape Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of City and/or Landscape Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. City and/or Landscape Architect's action may include a request for additional information, in which case City and/or Landscape Architect's time for response will date from time of receipt by City and/or Landscape Architect of additional information.
 3. City and/or Landscape Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify City and/or Landscape Architect in writing within 5 days

of receipt of the RFI response.

- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of City and/or Landscape Architect.
 4. RFI number, including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date City and/or Landscape Architect's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. On receipt of City and/or Landscape Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify City and/or Landscape Architect within seven days if Contractor disagrees with response.

1.7 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify City and/or Landscape Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including City and/or Landscape Architect, within three days of the meeting.
- B. Preconstruction Conference: City and/or Landscape Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to City and/or Landscape Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of City and/or Landscape Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.

- f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - l. Distribution of the Contract Documents.
 - m. Submittal procedures.
 - n. Preparation of Record Documents.
 - o. Use of the premises.
 - p. Work restrictions.
 - q. Working hours.
 - r. Responsibility for temporary facilities and controls.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management and recycling.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Progress Meetings: Conduct progress meetings at regular intervals.

- 1. Coordinate dates of meetings with preparation of payment requests.
- 2. Attendees: In addition to representatives of City and/or Landscape Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
- 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.

- 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site use.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of Proposal Requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- D. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of City and/or Landscape Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:

- 1) Interface requirements.
- 2) Sequence of operations.
- 3) Status of submittals.
- 4) Deliveries.
- 5) Off-site fabrication.
- 6) Access.
- 7) Site use.
- 8) Temporary facilities and controls.
- 9) Work hours.
- 10) Hazards and risks.
- 11) Progress cleaning.
- 12) Quality and work standards.
- 13) Status of RFIs.
- 14) Proposal Requests.
- 15) Change Orders.
- 16) Pending changes.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013300
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
2. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require City and/or Landscape Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require City and/or Landscape Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by City and/or Landscape Architect and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of

- long lead time for manufacture or fabrication.
- 3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
- 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for City and/or Landscape Architect's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled date of fabrication.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.4 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
 - 1. Project name.
 - 2. Date.
 - 3. Name of City and/or Landscape Architect.
 - 4. Name of Construction Manager.
 - 5. Name of Contractor.
 - 6. Name of firm or entity that prepared submittal.
 - 7. Names of subcontractor, manufacturer, and supplier.
 - 8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 - 9. Category and type of submittal.
 - 10. Submittal purpose and description.
 - 11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 - 12. Drawing number and detail references, as appropriate.
 - 13. Indication of full or partial submittal.
 - 14. Location(s) where product is to be installed, as appropriate.
 - 15. Other necessary identification.
 - 16. Remarks.
 - 17. Signature of transmitter.
- B. Options: Identify options requiring selection by City and/or Landscape Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by City and/or Landscape Architect on previous submittals. Indicate by highlighting on each submittal or

noting on attached separate sheet.

D. Paper Submittals:

1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
2. Provide a space approximately 4x6 on label or beside title block to record Contractor's review and approval markings and action taken by City and/or Landscape Architect.
3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. City and/or Landscape Architect will return two copies.
4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. City and/or Landscape Architect will not return copies.
5. Additional Copies: Unless additional copies are required for final submittal, and unless City and/or Landscape Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
6. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using transmittal form.

E. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package and transmit to City and/or Landscape Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by City and/or Landscape Architect.
 - a. City and/or Landscape Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

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

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. City and/or Landscape Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on City and/or Landscape Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. City and/or Landscape Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Landscape Architect's consultants, City, or other parties is indicated, allow 21 days for initial review of each submittal.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to City and/or Landscape Architect and to Landscape Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to City and/or Landscape Architect before being returned to Contractor.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to City and/or Landscape Architect
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from City and/or Landscape Architect's action stamp.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from City and/or Landscape Architect's action stamp.

1.6 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.

- b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 - 4. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
- 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 - 2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 24x36.
 - a. Two opaque (bond) copies of each submittal. City and/or Landscape Architect will return one copy.
 - b. Three opaque copies of each submittal. City and/or Landscape Architect will retain two copies; remainder will be returned.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
- 1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
 - 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 - 3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
 - 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be

used to determine final acceptance of construction associated with each set.

- a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as City and/or Landscape Architect's property, are the property of Contractor.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
- a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. City and/or Landscape Architect will return submittal with options selected.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
- a. Number of Samples: Submit three sets of Samples. City and/or Landscape Architect will retain two Sample sets; remainder will be returned.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least **[three]<Insert number>** sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Landscape Architects and City's, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of

assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.

- d. Product and manufacturers' names.
- e. Description of product.
- f. Test procedures and results.
- g. Limitations of use.

1.7 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to City and/or Landscape Architect.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - 1. City and/or Landscape Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.8 CITY AND/OR LANDSCAPE ARCHITECT'S REVIEW

- A. Action Submittals: City and/or Landscape Architect will review each submittal, indicate corrections or revisions required, and return.
 - 1. PDF Submittals: City and/or Landscape Architect will indicate, via markup on each submittal, the appropriate action .
 - 2. Paper Submittals: City and/or Landscape Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: City and/or Landscape Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. City and/or Landscape Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from City and/or Landscape Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. City and/or Landscape Architect will discard submittals received from sources other than Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities to be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, City and/or Landscape Architect, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from City's existing water system is available for use with metering. Provide connections and extensions of services and metering as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from City's existing system is available for use with metering. Provide connections and extensions of services and metering as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- E. Noise and Vibration Control Plan: Identify construction activities that may impact the

occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by City. Include the following:

1. Methods used to meet the goals and requirements of City.
2. Concrete cutting method(s) to be used.
3. Location of construction devices on the site.
4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with City.
6. Indicate locations of sensitive areas or other areas requiring special attention as identified by City. Indicate means for complying with City's requirements.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in United States Access Board's ADA-ABA Accessibility Guidelines.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before City's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized-steel bases for supporting posts.
- B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by City and/or Landscape Architect from manufacturer's standard colors.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.

2.2 TEMPORARY FACILITIES

A. Field Offices:

1. Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as City's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, City, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations.
 - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Use designated areas of City's existing parking areas for construction personnel.
- D. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
- F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touch up signs, so they are legible at all times.
- G. Waste Disposal Facilities:
 - 1. Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

- C. Temporary Erosion and Sedimentation Control:
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and 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 materials approved by authorities having jurisdiction.
- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to City.
- G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. City reserves right to take possession of Project identification signs.
 - 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove

materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION

**SECTION 017700
CLOSEOUT PROCEDURES**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final Completion procedures.
 - 3. List of incomplete items.
 - 4. Submittal of Project warranties.
 - 5. Final cleaning.
- B. Related Requirements:
 - 1. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

1.2 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the City and/or Landscape Architect's use prior to City and/or Landscape Architect's inspection, to determine if the Work is substantially complete.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting City, typical all locations unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by City and/or Landscape Architect. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain City's signature for receipt of submittals.
 - 5. Submit testing, adjusting, and balancing records.
 - 6. Submit sustainable design submittals not previously submitted.
 - 7. Submit changeover information related to City's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise City of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to City. Advise City's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Advise City of changeover in utility services.
 - 6. Participate with City in conducting inspection and walkthrough with local emergency

- responders.
 - 7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 8. Complete final cleaning requirements.
 - 9. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, City and/or Landscape Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. City and/or Landscape Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by City and/or Landscape Architect, that must be completed or corrected before certificate will be issued.
- 1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
- 1. Certified List of Incomplete Items: Submit certified copy of City and/or Landscape Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by City and/or Landscape Architect. Certified copy of the list will state that each item has been completed or otherwise resolved for acceptance.
 - 2. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 3. Submit pest-control final inspection report.
 - 4. Submit Final Completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, City and/or Landscape Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. City and/or Landscape Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
- 1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS

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

1. Organize list of spaces in sequential order, listed by space.
2. Organize items applying to each space by major element, including categories for equipment, and building systems.
3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of City and/or Landscape Architect .
 - d. Name of Contractor.
 - e. Page number.
4. Submit list of incomplete items in the following format:
 - a. PDF Electronic File: City and/or Landscape Architect will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of City and/or Landscape Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit City's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by City during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 1. Submit by email to City and/or Landscape Architect.
- E. Warranties in Paper Form:
 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Clean flooring, removing debris, dirt, and staining; clean in accordance with manufacturer's instructions.
 - h. Vacuum and mop concrete.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.
 - k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

- m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - n. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
 - o. Clean strainers.
 - p. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 015000 "Temporary Facilities and Controls."

3.2 CORRECTION OF THE WORK

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

END OF SECTION

SECTION 017839
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 017700 "Closeout Procedures" for general closeout procedures.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set(s) of marked-up record prints.
 - 2. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit one paper-copy set(s) of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
 - 3) Submit Record Digital Data Files and one set(s) of plots.
 - 4) City and/ or Landscape Architect, all locations will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit three paper-copy set(s) of marked-up record prints.
 - 2) Submit PDF electronic files of scanned Record Prints and three set(s) of file prints.
 - 3) Print each drawing, whether or not changes and additional information were recorded.
 - c. Final Submittal:
 - 1) Submit one paper-copy set(s) of marked-up record prints.
 - 2) Submit Record Digital Data Files and three set(s) of Record Digital Data

- 3) File plots.
Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.3 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Work Change Directive.
 - k. Changes made following City and/or Landscape Architect's written orders.

- l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with City and/or Landscape Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as for the original Contract Drawings.
 2. Format: DWG, Microsoft Windows operating system.
 3. Format: Annotated PDF electronic file with comment function enabled.
 4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 5. Refer instances of uncertainty to City and/or Landscape Architect for resolution.
 6. City and/or Landscape Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
 - a. City and/or Landscape Architect will provide data file layer information. Record markups in separate layers.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of City and/or Landscape Architect.
 - e. Name of Contractor.

1.4 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 - 5. Note related Change Orders , Record Product Data, and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file.

1.5 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders , Record Specifications, and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file.
 - 1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.6 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.7 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for City and/or Landscape Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

**SECTION 024119
SELECTIVE DEMOLITION**

PART 1 - GENERAL

1.1 SUMMARY

- A. The Work of this Section Includes:
 - 1. Demolition and removal of selected portions of site elements.
- B. Related Requirements:
 - 1. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to City as indicated.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage; prepare for reuse; and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed.

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 City that may be uncovered during demolition remain the property of City.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to City.

1.4 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with City's operations.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review and finalize selective demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review areas where existing construction is to remain and requires protection.
 - 4. Review and finalize protection requirements.
 - 5. Review procedures for noise control and dust control.
 - 6. Review storage, protection, and accounting for items to be removed for salvage or reinstallation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For refrigerant recovery technician.
- B. Engineering Survey: Submit engineering survey of condition of building.
- C. Survey of Existing Conditions: Submit survey.
- D. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- E. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure City's on-site operations are uninterrupted.
 - 2. Temporary interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
- F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by City as far as practical.
- B. Notify City and/ or Landscape Architect, all locations of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials:

1. It is not expected that hazardous materials will be encountered in the Work.
 - a. Hazardous materials will be removed by City before start of the Work.
 - b. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify City and/or Landscape Architect. Hazardous materials will be removed by City under a separate contract.
- D. On-site 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 selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by City. City does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
 1. Inventory and record the condition of items to be removed for salvage or reinstallation. Photograph or video conditions that might be misconstrued as damage caused by removal.
 2. Photograph or video existing conditions of adjoining construction including finish surfaces, that might be misconstrued as damage caused by selective demolition operations or removal of items for salvage or reinstallation.

3.2 PREPARATION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling

during selective demolition. When permitted by City and/or Landscape Architect, items may be removed to a suitable, protected storage location and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.3 UTILITY SERVICES AND BUILDING SYSTEMS

- A. Existing Services/Systems to Remain: Maintain utilities and building systems and equipment to remain and protect against damage during selective demolition operations.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Maintain adequate ventilation when using cutting torches.
 - 5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. 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 flooding and pollution.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete:
 - 1. Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
 - 2. Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

- B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished and then break up.

3.6 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.
 - 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. Burning: Do not burn demolished materials.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

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 321313 "Concrete Paving" for reinforcing related to concrete pavement and walks.

1.2 PREINSTALLATION MEETINGS

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. Construction contraction and isolation joints.
 - c. 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.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of City and/or Landscape Architect.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For testing and inspection agency.
- B. Welding certificates.
 1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.
- C. 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."
- D. 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.
- E. Field quality-control reports.
- F. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, 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/D1.4M.
- C. Mockups: Reinforcing for cast-concrete formed surfaces, to demonstrate tolerances and standard of workmanship.
 1. Build panel approximately 100 sq. ft. for formed surface in the location indicated on Drawings or, if not indicated, as directed by City and/or Landscape Architect.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage and to avoid damaging coatings on steel reinforcement.

1. Store reinforcement to avoid contact with earth.
2. Do not allow epoxy-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.
3. Do not allow dual-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.
4. Do not allow stainless steel reinforcement to come into contact with uncoated reinforcement.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Galvanized Reinforcing Bars:
 1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
 2. Zinc Coating: ASTM A767/A767M, Class I zinc coated after fabrication and bending.
- C. Epoxy-Coated Reinforcing Bars:
 1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
 2. Epoxy Coating: ASTM A775/A775M with less than 2 percent damaged coating in each **12-inch** bar length.
- D. Dual-Coated Reinforcing Bars: ASTM A1055/A1055M.
 1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
 2. Zinc Coating: ASTM A1055/A1055M Type I.
 3. Epoxy Coating: ASTM A775/A775M with less than 2 percent damaged coating in each **12-inch** bar length.
- E. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60, deformed bars, assembled with clips.
- F. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.
- G. Galvanized-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from galvanized-steel wire into flat sheets.
- H. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A coated, Type 1, deformed steel.

2.2 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Epoxy-Coated Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, ASTM A775/A775M epoxy coated.
- C. 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.
 - b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - c. For dual-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - d. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.
- D. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than **0.0508 inch** in diameter.
 - 1. Finish: Plain.
- E. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A775/A775M.
- F. Zinc Repair Material: ASTM A780/A780M.

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, 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.
- 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, whichever is greater.
 - 2. Stagger splices in accordance with ACI 318.
- G. Install welded-wire reinforcement in longest practicable lengths.
 - 1. 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.
 - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
 - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 - 4. Lace overlaps with wire.
- H. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating in accordance with ASTM D3963/D3963M.
- I. Dual-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating in accordance with ASTM D3963/D3963M.
- J. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material in accordance with ASTM A780/A780M.

3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by City and/or Landscape 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.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: City will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 1. Steel-reinforcement placement.
 2. Steel-reinforcement mechanical splice couplers.
 3. Steel-reinforcement welding.

END OF SECTION

**SECTION 033000
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.1 SUMMARY

1. Concrete standards.
2. Concrete materials.
3. Repair materials.
4. Concrete mixture materials.
5. Concrete mixture class types.
6. Concrete mixing.

B. Related Requirements:

1. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
2. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.
3. Section 321313 "Concrete Paving" for concrete pavement and walks.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement or blended hydraulic cement alone or in combination with one or more of the following:

1. Fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cementitious Materials (w/cm) Ratio: The ratio by weight of mixing water to cementitious materials.

1.3 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 inspections and acceptance testing of concrete at Project site.
 - c. Concrete Subcontractor.
 - d. 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. Vapor-retarder installation.
- e. Anchor rod and anchorage device installation tolerances.
- f. Cold- and hot-weather concreting procedures.
- g. Concrete finishes and finishing.
- h. Curing procedures.
- i. Forms and form-removal limitations.
- j. Concrete repair procedures.
- k. Concrete protection.
- l. Initial curing of standard-cured and field curing of field-cured test cylinders (ASTM C31/C31M.)
- m. Protection of field cured field test cylinders.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture, include the following:
 - 1. Submit adjustments to design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant changes.
- 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 City and/or Landscape Architect.
- D. Concrete Schedule: For each location of each class of concrete indicated in "Concrete Mixture Class Types" Article, including the following:
 - 1. Concrete class designation.
 - 2. Location within Project.
 - 3. Exposure class designation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
 - 1. Installer: Include copies of applicable ACI certificates.
 - 2. Testing Agency: Include documentation indicating compliance with ASTM E329 or ASTM C1077 and copies of applicable ACI certificates for testing technicians or ACI Concrete Construction Special Inspector - MH, ASCC.

- B. Material Certificates: For each type of product.
- C. Material Test Reports: For each type of product.
- D. Research Reports:
 - 1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
 - 2. For sheet vapor retarder/termite barrier, showing compliance with ICC's Acceptance Criteria AC380.
- E. Preconstruction Test Reports: For each mix design.
- F. Field quality-control reports.
- G. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified Installer who employs Project personnel qualified as an ACI-certified Concrete Flatwork Associate and Concrete Flatwork Finisher and a supervisor who is a certified ACI Advanced Concrete Flatwork Finisher/Technician or an ACI Concrete Flatwork Finisher with experience installing and finishing concrete.
- 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's production facilities and delivery vehicles certified in accordance with NRMCA's certification requirements or equivalent approval by a State DOT.
- C. Mockups: Cast concrete slab-on-ground panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship. Provide up to two batches of concrete to demonstrate the number of required mockups.
 - 1. Slab-on-Ground: Build panel in the location indicated or, if not indicated, as directed by City and/or Landscape Architect.
 - a. Divide panel into four equal panels to demonstrate saw joint cutting.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

1.8 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 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 air temperature has fallen to, or is expected to fall below 40 deg F during the protection period, 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.

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.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE STANDARDS

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, gray.
2. Pozzolans: ASTM C618, Class C, F, or N.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
4. Ground Glass Pozzolan: ASTM C1866/C1866M, Type GS or GE.
5. Silica Fume: ASTM C1240.

C. Normal-Weight Aggregates:

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: ASTM C33/C33M.

2.3 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260/C260M.

2.4 CURING MATERIALS

- A. Water: Potable water that does not cause staining of the surface.

2.5 ACCESSORIES

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C881/C881M, 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, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.6 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.7 CONCRETE MIXTURE MATERIALS

- 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 corrosion-inhibiting admixture in concrete mixtures where indicated.
 2. Use permeability-reducing admixture in concrete mixtures where indicated.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish delivery ticket.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 1. Before placing concrete, verify that installation of concrete forms, accessories, 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.

3.3 TOLERANCES

- A. Comply with ACI 117.

3.4 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 reglets to receive waterproofing and through-wall flashings in outer face of

concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.5 INSTALLATION OF CAST-IN-PLACE CONCRETE

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
 - 1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 - 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify City and/or Landscape Architect, all locations and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Water addition in transit or at the Project site must be in accordance with ASTM C94/C94M and must not exceed the permitted amount indicated on the concrete delivery ticket.
- 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.
- 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 INSTALLATION OF 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 City and/or Landscape Architect.

2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 3. Use a bonding agent 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 inch below 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.
- F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.
- 3.7 APPLICATION OF FINISHING FLOORS AND SLABS
- A. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with a fiber-bristle broom perpendicular to main traffic route.
 2. Coordinate required final finish with City and/or Landscape Architect before application.

3.8 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling in:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to match color and texture with in-place construction exposed to view.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 2500 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.
 - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.
 - c. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.9 APPLICATION OF CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 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, calculated in accordance with ACI 305R, before and during finishing operations.

3.10 INSTALLATION OF JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s).

- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least **2 inches** deep in formed joints.
- D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.11 INSTALLATION OF CONCRETE SURFACE REPAIRS

- A. Defective Concrete:
 - 1. Repair and patch defective areas when approved by City and/or Landscape Architect.
 - 2. Remove and replace concrete that cannot be repaired and patched to meet specification requirements.
- B. Perform structural repairs of concrete, subject to City and/or Landscape Architect's approval, using epoxy adhesive and patching mortar.
- C. Repair materials and installation not specified above may be used, subject to City and/or Landscape Architect's approval.

3.12 FIELD QUALITY CONTROL

- A. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to 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 is to 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 delivery for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests as needed.
 - 3. Unit Weight: ASTM C138/C138M density of fresh 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. The fresh density should be consistent with that associated with the equilibrium density within a tolerance of plus or minus 4 lb/ft.³.
 - 4. Compression Test Specimens: ASTM C31/C31M:

- a. Cast, and field cure two sets of two standard cylindrical specimens for each composite sample.
5. Compressive-Strength Tests: ASTM C39/C39M.
 - a. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
6. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests of standard cured cylinders 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.
8. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by City and/or Landscape Architect but will not be used as sole basis for approval or rejection of concrete.
9. Additional Tests:
 - a. Testing and inspecting agency to 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 City and/or Landscape 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 City and/or Landscape Architect.
 - 1) Acceptance criteria for concrete strength to be in accordance with **ACI 301**, Section 1.7.6.3.
10. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
11. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.13 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit use of pipe-cutting machinery over concrete surfaces.
4. Prohibit placement of steel items on concrete surfaces.
5. Prohibit use of acids or acidic detergents over concrete surfaces.

END OF SECTION

SECTION 260010
SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes requirements generally applicable to all electrical Work on the Project, including but not limited to Work specified in Divisions 26, 27, and 28.
- B. Related Requirements:
 - 1. Section 018116 "Facility Environmental Requirements" specifies basis-of-design environmental conditions and performance criteria that are applicable to product selection and installation of the Work on the Project.
 - 2. Section 018123 "Facility Seismic and Wind Criteria" specifies basis-of-design seismic and wind criteria for nonstructural components on the Project.
 - 3. Section 013100 "Project Management and Coordination" specifies preinstallation conference procedures.

1.2 REFERENCES

- A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:
 - 1. A: Ampere, unit of electrical current.
 - 2. AC or ac: Alternating current.
 - 3. AFCI: Arc-fault circuit interrupter.
 - 4. AGC: Automatic gain control.
 - 5. AIC: Ampere interrupting capacity.
 - 6. AL, Al, or ALUM: Aluminum.
 - 7. ASD: Adjustable-speed drive.
 - 8. ATP: Acceptance test procedure.
 - 9. ATS: Automatic transfer switch.
 - 10. A/V: Audio/visual.
 - 11. AWG: American wire gauge; see ASTM B258.
 - 12. BAS: Building automation system.
 - 13. BDA: Bi-directional amplifier.
 - 14. BIL: Basic impulse insulation level.
 - 15. BIM: Building information modeling.
 - 16. BMS: Building management system.
 - 17. BNC: Bayonet Neill-Concelman - type of connector.
 - 18. B/W: Black and white.
 - 19. CAD: Computer-aided design or drafting.
 - 20. CATV: Community antenna television.
 - 21. CB: Circuit breaker.
 - 22. CCD: Charge-coupled device.

23. CCTV: Closed-circuit television.
24. cd: Candela, the SI fundamental unit of luminous intensity.
25. CO/ALR: Copper-aluminum, revised.
26. COPS: Critical operations power system.
27. CU or Cu: Copper.
28. CU-AL or AL-CU: Copper-aluminum.
29. DACR: Digital alarm communicator receiver.
30. DACT: Digital alarm communicator transmitter.
31. DAS: Distributed antenna system.
32. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.
33. dB(A-weighted) or dB(A): Decibel acoustical sound pressure level with A-weighting applied in accordance with IEC 61672-1.
34. dB(adjusted) or dBa: Decibel weighted absolute noise power with respect to 3.16 pW (minus 85 dBm).
35. dBm: Decibel absolute power with respect to 1 mW.
36. dBmV: Decibel absolute voltage with respect to 1 mV across identical impedance.
37. DC or dc: Direct current.
38. DCOA: Designated critical operations area.
39. DDC: Direct digital control (HVAC).
40. DGP: Data gathering panel.
41. DHCP: Dynamic host configuration protocol.
42. EGC: Equipment grounding conductor.
43. ELV: Extra-low voltage.
44. EMF: Electromotive force.
45. EMI: Electromagnetic interference.
46. EMP: Electrical maintenance program (operation and maintenance); electromagnetic pulse (transient analysis).
47. EPS: Emergency power supply.
48. EPSS: Emergency power supply system.
49. ERCES: Emergency responder communications enhancement system.
50. ESS: Energy storage system.
51. EV: Electric vehicle.
52. EVPE: Electric vehicle power export equipment.
53. EVSE: Electric vehicle supply equipment.
54. FACU: Fire-alarm control unit.
55. FAS: Fire-alarm system.
56. fc: Footcandle, an internationally recognized unit of illuminance equal to one lumen per square foot or 10.76 lx. The simplified conversion 1 fc = 10 lx in the Specifications is common practice and considered adequate precision for building construction activities. When there are conflicts, lux is the primary unit; footcandle is specified for convenience.
57. FCC: Federal Communications Commission; fire command center.
58. FLC: Full-load current.
59. ft: Foot.
60. FTP: File transfer protocol.
61. FXO: Foreign exchange office.
62. GEC: Grounding electrode conductor.
63. GFCI: Ground-fault circuit interrupter.
64. GFPE: Ground-fault protection of equipment.
65. GND: Ground.
66. GROL: General Radiotelephone Operator License (FCC).

67. H.323: Audio and video protocol.
68. HACR: Heating, air conditioning, and refrigeration.
69. HDPE: High-density polyethylene.
70. HID: High-intensity discharge.
71. HP or hp: Horsepower.
72. HVAC: Heating, ventilating, and air conditioning.
73. Hz: Hertz.
74. I&TFAS: Inspection and testing of fire-alarm system.
75. IB-PSC: In-building public safety communications.
76. IBT: Intersystem bonding termination.
77. ICT: Information and communications technology.
78. IDC: Initiating device circuit.
79. inch: Inch. To avoid confusion, the abbreviation "in." is not used.
80. I/O: Input/output.
81. IP: Ingress protection rating (enclosures); Internet protocol (communications).
82. IR: Infrared.
83. IS: Intrinsically safe.
84. IT&R: Inspecting, testing, and repair.
85. ITE: Information technology equipment.
86. kAIC: Kiloampere interrupting capacity.
87. kcmil or MCM: One thousand circular mils.
88. kV: Kilovolt.
89. kVA: Kilovolt-ampere.
90. kvar: Kilovolt-ampere reactive.
91. kW: Kilowatt.
92. kWh: Kilowatt-hour.
93. LAN: Local area network.
94. lb: Pound (weight).
95. lbf: Pound (force).
96. LCD: Liquid-crystal display.
97. LCDI: Leakage-current detector-interrupter.
98. LED: Light-emitting diode.
99. Li-ion: Lithium-ion.
100. lm: Lumen, the SI-derived unit of luminous flux.
101. LNG: Liquefied natural gas.
102. LP-Gas: Liquefied petroleum gas.
103. LRC: Locked-rotor current.
104. LTE: Long-term evolution (mobile device technology standard).
105. LV: Low voltage.
106. lx: Lux, the SI-derived unit of illuminance equal to one lumen per square meter.
107. m: Meter.
108. MATV: Master antenna television.
109. MCC: Motor-control center.
110. MDC: Modular data center.
111. MG set: Motor-generator set.
112. MIDI: Musical instrument digital interface.
113. MLO: Main lugs only.
114. MPEG: Moving Picture Experts Group.
115. MPEG-2: Abbreviation for the ISO/IEC Moving Picture Experts Group's standard for generic coding of moving pictures and associated audio information (ISO/IEC 13818) released in 1995 and used for most over-the-air and satellite broadcast digital television.

- 116. MPEG-4: Abbreviation for the ISO/IEC Moving Picture Experts Group's standard framework for coding of audio-visual objects (ISO/IEC 14496) released in 1999, with digital rights management and more advanced compression algorithms than MPEG-2.
- 117. MOV: Metal-oxide varistor.
- 118. MV: Medium voltage.
- 119. MVA: Megavolt-ampere.
- 120. mW: Milliwatt.
- 121. MW: Megawatt.
- 122. MWh: Megawatt-hour.
- 123. NAC: Notification appliance circuit.
- 124. N.C.: Normally closed.
- 125. NFC: Near field communications.
- 126. Ni-Cd: Nickel-cadmium.
- 127. NICET: National Institute for Certification in Engineering Technologies, a division of the National Society of Professional Engineers.
- 128. Ni-MH: Nickel-metal hydride.
- 129. NIU: Network interface unit.
- 130. N.O.: Normally open.
- 131. NPT: National (American) standard pipe taper.
- 132. NTSC: National Television System Committee.
- 133. OCPD: Overcurrent protective device.
- 134. ONT: Optical network terminal.
- 135. PC: Personal computer.
- 136. PCS: Power conversion system.
- 137. PCU: Power-conditioning unit.
- 138. Percent obs/ft (percent obs/m): Percent obscuration per unit distance; unit of measure for sensitivity of smoke detectors.
- 139. PF or pf: Power factor.
- 140. PHEV: Plug-in hybrid electric vehicle.
- 141. PIR: Passive infrared.
- 142. PLC: Programmable logic controller.
- 143. PLFA: Power-limited fire alarm.
- 144. PoE: Power over Ethernet.
- 145. POTS: Plain old telephone service. See "public switched telephone network" definition.
- 146. PSTN: Public switched telephone network.
- 147. PTZ: Pan-tilt-zoom.
- 148. PV: Photovoltaic.
- 149. PVC: Polyvinyl chloride.
- 150. pW: Picowatt.
- 151. RAID: Redundant array of inexpensive disks; redundant array of independent disks.
- 152. RAM: Random-access memory.
- 153. RAT: Radio alarm transmitter.
- 154. REX: Request-to-exit.
- 155. RF: Radio frequency.
- 156. RFI: (electrical) Radio-frequency interference; (contract) Request for interpretation.
- 157. RMS or rms: Root-mean-square.
- 158. RPM or rpm: Revolutions per minute.
- 159. SCADA: Supervisory control and data acquisition.
- 160. SCCR: Short-circuit current rating.
- 161. SCR: Silicon-controlled rectifier.
- 162. SIP: Session initiation protocol.

163. SLC: Signaling-line circuit.
164. SPD: Surge protective device.
165. SPDT: Single pole, double throw.
166. sq.: Square.
167. SWD: Switching duty.
168. TCP/IP: Transmission Control Protocol/Internet Protocol.
169. TEFC: Totally enclosed fan-cooled.
170. TR: Tamper resistant.
171. TVSS: Transient voltage surge suppressor.
172. UHF: Ultra-high frequency.
173. UL: (standards) UL Standards & Engagement Inc.; (product categories) UL, LLC.
174. UL CCN: UL Category Control Number.
175. UPS: Uninterruptible power supply.
176. USB: Universal serial bus.
177. UTC: Coordinated universal time.
178. UV: Ultraviolet.
179. V: Volt, unit of electromotive force.
180. V(ac): Volt, alternating current.
181. V(dc): Volt, direct current.
182. VA: Volt-ampere, unit of complex electrical power.
183. VAR: Volt-ampere reactive, unit of reactive electrical power.
184. VFC: Variable-frequency controller.
185. VOM: Volt-ohm-multimeter.
186. VoIP: Voice over Internet Protocol.
187. VPN: Virtual private network.
188. VRLA: Valve regulated lead acid; also called "sealed lead acid (SLA)" or "valve regulated sealed lead acid."
189. VU: Volume unit.
190. W: Watt, unit of real electrical power.
191. WAN: Wide area network.
192. Wh: Watt-hour, unit of electrical energy usage.
193. WPT: Wireless power transfer.
194. WPTE: Wireless power transfer equipment.
195. WR: Weather resistant.

B. Abbreviations and Acronyms for Electrical Raceway Types:

1. EMT: Electrical metallic tubing.
2. ENT: Electrical nonmetallic tubing.
3. EPEC: Electrical HDPE underground conduit (thin wall).
4. ERMC: Electrical rigid metal conduit.
5. FMC: Flexible metal conduit.
6. FMT: Steel flexible metallic tubing.
7. FNMC: Flexible nonmetallic conduit. See "LFNC."
8. HDPE: HDPE underground conduit (thick wall).
9. HDPE-40: Schedule 40 HDPE underground conduit.
10. HDPE-80: Schedule 80 HDPE underground conduit.
11. IMC: Steel electrical intermediate metal conduit.
12. LFMC: Liquidtight flexible metal conduit.
13. LFNC: Liquidtight flexible nonmetallic conduit.
14. PVC: Rigid PVC conduit.

15. PVC-40: Schedule 40 rigid PVC conduit.
16. PVC-80: Schedule 80 rigid PVC Conduit.
17. RGS: See ERM-C-S-G.
18. RMC: See ERM-C.
19. RTRC: Reinforced thermosetting resin conduit.

C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:

1. AC: Armored cable.
2. CATV: Coaxial general-purpose cable.
3. MC: Metal-clad cable.
4. MI: Mineral-insulated, metal-sheathed cable.
5. MV: Medium-voltage cable.
6. NM: Nonmetallic sheathed cable.
7. SER: Service-entrance cable, round.
8. TC: Tray cable.
9. THW: Thermoplastic, heat- and moisture-resistant cable.
10. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
11. THHW: Thermoplastic, heat- and moisture-resistant cable.
12. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.
13. XHHW: Cross-linked polyethylene, heat- and moisture-resistant cable.

D. Definitions:

1. 8-Position 8-Contact (8P8C) Modular Jack: An unkeyed jack with up to eight contacts commonly used to terminate twisted pair and multiconductor Ethernet cable. Also called a "TIA-1096 miniature 8-position series jack" (8PSJ), or an "IEC 8877 8-pole jack."
 - a. Be careful when suppliers use "RJ45" generically. Obsolete RJ45 jacks used for analog telephone cables have rejection keys. 8P8C jacks used for digital telephone cables and Ethernet cables do not have rejection keys.
2. Backbone: Primary segment of ERCES between donor antenna and distribution cabling.
3. Broadband: For the purposes of this Section, wide bandwidth equipment or systems that can carry signals occupying in the frequency range of 54 to 1002 MHz. A broadband communication system can simultaneously accommodate television, voice, data, and many other services.
4. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
5. Carrier: A pure-frequency signal that is modulated to carry information. In the process of modulation, the signal is spread out over a wider band. The carrier frequency is the center frequency on any television channel.
6. Channels: Separate parallel signal paths, from sources to loudspeakers or loudspeaker zones, with separate amplification and switching that permit selection between paths for speaker alternative program signals.
7. Communications Jack: A fixed connecting device designed for insertion of a communications cable plug.

8. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
9. Conductive Cable: Cable containing non-current-carrying electrically conductive members such as metallic strength members and metallic vapor barriers.
10. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.
11. Conduit: A structure containing one or more duct raceways.
12. Control Unit: A system component that monitors inputs and controls outputs through various types of circuits.
13. Designated Seismic System: An architectural, electrical, or mechanical system and its components for which the component importance factor is greater than 1.0 when determined in accordance with Section 018123 "Facility Seismic and Wind Criteria."
14. Direct Buried: Installed underground without encasement in concrete or other protective material.
15. Duct Bank: An arrangement of conduit providing one or more continuous duct raceways between two points.
16. Duct Raceway: A single enclosed raceway for conductors or cable.
17. Electrical Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
18. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction that is designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety of human life.
19. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
 - a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
 - b. Concrete Box: A box intended for use in poured concrete.
 - c. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
 - d. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
 - e. Cover Plate: A cover designed for protecting wiring devices installed in flush-mounted device boxes while permitting their safe operation; also called a faceplate or wallplate.
 - f. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
 - g. Device Box: A box with provisions for mounting a wiring device directly to the box.
 - h. Extension Ring: A ring intended to extend the sides of an outlet box or device box

- to increase the box depth, volume, or both.
 - i. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
 - j. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
 - k. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
 - l. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
 - m. Pedestal Floor Box Cover: A floor box cover that, when installed as intended, provides a means for typically vertical or near-vertical mounting of receptacle outlets above the floor's finished surface.
 - n. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
 - o. Raised-Floor Box: A floor box intended for use in raised floors.
 - p. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.
 - q. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.
 - r. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
 - s. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
 - t. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.
20. Fault Limited: Providing or being served by a source of electrical power that is limited to not more than 100 W when tested in accordance with UL 62368-1.
- a. The term "fault limited" is intended to encompass most Class 1, 2, and 3 power-limited sources complying with Article 725 of NFPA 70; Class ES1 and ES2 electrical energy sources that are Class PS1 electrical power sources (e.g., USB); and Class ES3 electrical energy sources that are Class PS1 and PS2 electrical power sources (e.g., PoE). See UL 62368-1 for discussion of classes of electrical energy sources and classes of electrical power sources.
21. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.
22. Jack: Also commonly called an "outlet," it is the fixed, female connector.
23. Jacket: A continuous nonmetallic outer covering for conductors or cables.
24. Local Operator Console (LOC): Equipment used by authorized personnel and emergency responders to activate and operate a mass notification system (MNS).
25. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together

- with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
26. Master Control Unit: System component that accepts inputs from other control units and may also perform control-unit functions. The unit has limited capacity for the number of protected zones and is installed at an unattended location or at a location where it is not the attendant's primary function to monitor the security system.
 27. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the Energy Independence and Security Act (EISA) of 2007.
 28. Monitoring: Acquisition, processing, communication, and display of system and equipment status data and event and alarm signals.
 29. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
 30. Nonsecure: Unlocked or open. (For doors and gates.)
 31. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein. Also called "single-line diagram."
 32. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
 33. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.
 34. Protected Zone: A protected premises or an area within a protected premises that is provided with means to prevent an unwanted event.
 35. Protective Device: A device that senses when an abnormal current flow, abnormal voltage potential, or other abnormal electrical waveform exists and then disconnects the affected portion of the circuit from the system. Common protective devices include fuses, circuit breakers, relays, ground-fault circuit interrupters, and arc-fault circuit interrupters.
 36. Public Switched Telephone Network (PSTN): Analog telephone technology that uses twisted pair cables from a telephone-provider central office for the transmission medium. "PSTN" refers to the telephone network; "POTS" refers to the individual subscriber line.
 37. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
 38. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
 39. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
 40. Secure: Closed and locked and with no unlock or open commands pending. (For doors and gates.)
 41. Sheath: A continuous metallic covering for conductors or cables.
 42. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
 43. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
 44. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
 - a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
 - b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The

- line-to-line voltage of the supplying power system.
 - c. Extra-Low Voltage (ELV): Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
 - d. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
 - e. Medium Voltage (MV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated about 1 kV but not exceeding 69 kV.
 - f. High Voltage: (1) (circuits) Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 69 kV but not exceeding 230 kV. (2) (safety) Having sufficient electromotive force to inflict bodily harm or injury.
45. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.
46. Zone. A defined area within a protected premises. It is a space or area for which an intrusion must be detected and uniquely identified. The sensor or group of sensors must then be assigned to perform the detection, and any interface equipment between sensors and communication must link to master control unit.

1.3 COORDINATION

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by City or others unless permitted under the following conditions:
1. Notify City no fewer than five business days in advance of proposed interruption of electrical service.
 2. Do not proceed with interruption of electrical service without City's written permission.
 3. Coordinate interruption with systems impacted by outage including, but not limited to, the following:
 - a. Exercising generators.
 - b. Emergency lighting.
 - c. Elevators.
 - d. Fire-alarm systems.
 4. Arrange to provide temporary emergency and standby electrical service so facility may remain occupied during the outage in accordance with requirements specified in Section 015000 "Temporary Facilities and Controls." Coordinate power requirements with City.
- B. Interruption of Existing Telephone Service: Do not interrupt telephone service to facilities occupied by City or others unless permitted under the following conditions:
1. Notify City no fewer than five business days in advance of proposed interruption of

2. telephone service.
2. Do not proceed with interruption of telephone service without City written permission.
- C. Interruption of Existing Internet Service: Do not interrupt internet service to facilities occupied by City or others unless permitted under the following conditions:
 1. Notify City no fewer than five business days in advance of proposed interruption of internet service.
 2. Do not proceed with interruption of internet service without City's written permission.
- D. Interruption of Existing Security System: Do not interrupt security system to facilities occupied by City or others unless permitted under the following conditions:
 1. Notify City no fewer than five business days in advance of proposed interruption of security system.
 2. Do not proceed with interruption of security system without City written permission.
- E. Interruption of Existing Fire-Alarm System: Do not interrupt fire-alarm system to facilities occupied by City or others unless permitted under the following conditions:
 1. Notify City no fewer than five business days in advance of proposed interruption of fire-alarm system.
 2. Do not proceed with interruption of fire-alarm system without City written permission.

1.4 PREINSTALLATION MEETINGS

- A. Electrical Preconstruction Conference: Schedule conference with Electrical Engineer and/or City, not later than 10 business days after Notice to Proceed. Agenda topics include, but are not limited to, the following:
 1. Electrical installation schedule.
 2. Status of power system studies.
 3. Value analysis proposals and requests for substitution of electrical equipment.
 4. Utility work coordination and class of service requests.
 5. Commissioning activities.
- B. Communications Preconstruction Conference: Schedule conference with Electrical Engineer and/or City not later than Insert number business days after Notice to Proceed. Agenda topics include, but are not limited to, the following:
 1. Installation schedule for communications systems.
 2. Value analysis proposals and requests for substitution of communications equipment.
 3. Utility services work coordination and monitoring service requests.
 4. Commissioning activities.
- C. Electronic Safety and Security Preconstruction Conference: Schedule conference with Electrical Engineer and/or City not later than 10 business days after Notice to Proceed. Agenda topics include, but are not limited to, the following:
 1. Installation schedule for security, fire-alarm, and other life-safety systems.

2. Value analysis proposals and requests for substitution of electronic safety and security equipment.
3. Monitoring services work coordination and monitoring service requests.
4. Commissioning activities.

1.5 SEQUENCING

- A. Conduct and submit results of power system studies before submitting product data and Shop Drawings for electrical equipment.

1.6 SCHEDULING

- A. Confirm any specific scheduling requests with client.

1.7 ACTION SUBMITTALS

- A. Coordination Drawings for Conduit Routing: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 1. Underground utility crossings, retaining walls, and the like that lie in the conduit path.
- B. Coordination Drawings for Large Equipment Outdoor Installations:
 1. Utilities site plan, drawn to scale, showing heavy equipment or truck access paths for maintenance and replacement, with the following items shown and coordinated with each other, based on input from installers of the items involved:
 - a. Fences and walls, dimensioned concrete bases, outlines of equipment, conduit entries, and grounding and bonding locations.
 - b. Indicate clear dimensions for fence gates and wall openings.
 - c. Indicate depth and type of ground cover, and locations of trees, shrubbery, and other obstructions in access path.
 - d. Indicate clear height below tree branches, overhead lines, bridges, and other overhead obstructions in access path, or where cranes and hoists will be needed to handle large electrical equipment.
 - e. Support locations, type of support, and weight on each support. Locate structural supports for structure-supported raceways.
 - f. Dimensioned working clearances and dedicated areas around electrical equipment.
- C. Coordination Drawings for Duct Banks:
 1. Show duct profiles and coordination with other utilities and underground structures.
 2. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.

1.8 INFORMATIONAL SUBMITTALS

- A. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to City and/or Electrical Engineer including, but not limited to, milestone dates for the following activities:

1. Submission of power system studies.
2. Submission of specified coordination drawings.
3. Submission of action submittals specified in Division 26.
4. Orders placed for major electrical equipment.
5. Arrival of major electrical equipment on-site.
6. Preinstallation meetings specified in Division 26.
7. Utility service outages.
8. Utility service inspection and activation.
9. Mockup reviews.
10. Closing of walls and trenches containing electrical Work.
11. System startup, testing, and commissioning activities for major electrical equipment.
12. System startup, testing, and commissioning activities for emergency lighting.
13. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
14. Pouring of concrete housekeeping pads for electrical equipment and testing of concrete samples.
15. Requests for special inspections.
16. Requests for inspections by authorities having jurisdiction.

- B. Installation Schedule for Communications Systems: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for installation of the communications Work to City and/or Electrical Engineer including, but not limited to, milestone dates for the following activities:

1. Submission of specified coordination drawings.
2. Submission of action submittals specified in Division 27.
3. Orders placed for major equipment.
4. Arrival of major equipment on-site.
5. Preinstallation meetings specified in Division 27.
6. Telephone and internet service outages.
7. Telephone and internet service inspection and activation.
8. Mockup reviews.
9. Closing of walls and ceilings containing the communications Work.
10. System startup, testing, and commissioning activities for communications equipment.
11. System startup, testing, and commissioning activities for the Work specified in other divisions that depends on the Work specified in Division 27.
12. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
13. Requests for special inspections.
14. Requests for inspections by authorities having jurisdiction.

- C. Installation Schedule for Security, Fire-Alarm, and Other Life-Safety Systems: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for installation of security, fire-alarm, and the other life-safety Work to City and/or Electrical Engineer including, but not limited to, milestone dates for the following activities:

1. Submission of specified coordination drawings.
2. Submission of action submittals specified in Division 28.
3. Orders placed for major equipment.
4. Arrival of major equipment on-site.
5. Preinstallation meetings specified in Division 28.
6. Security and fire-alarm system outages.
7. Security and fire-alarm system inspection and activation.
8. Mockup reviews.
9. Closing of walls and ceilings containing the security and fire-alarm Work.
10. System startup, testing, and commissioning activities for security and fire-alarm equipment.
11. System startup, testing, and commissioning activities for fire-alarm interfaces with the Work specified in other divisions.
12. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
13. Requests for special inspections.
14. Requests for inspections by authorities having jurisdiction.

D. Welding certificates.

E. Seismic Performance Certificates: Provide special certification for designated seismic systems as required to meet requirements specified in Section 018123 "Facility Seismic and Wind Criteria" for all designated seismic systems identified on the Drawings or in the Specifications.

1. Include the following information:
 - a. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - b. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - c. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - d. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
 - e. Equipment manufacturer's written certification for each designated active electrical seismic device and system, stating that it will remain operable following the basis-of-design seismic criteria specified in Section 018123 "Facility Seismic and Wind Criteria."
 - f. Equipment manufacturer's written certification that components with hazardous contents maintain containment following the basis-of-design seismic criteria specified in Section 018123 "Facility Seismic and Wind Criteria."
 - g. Evidence demonstrating compliance with these requirements for approval to authorities having jurisdiction after review and acceptance by qualified structural professional engineer.

F. Wind Performance Certificates: Provide special certification for systems and components designated on the Drawings or in the Specifications to be subject to high wind exposure and impact damage.

1. Include the following information:

- a. Provide equipment manufacturer's written certification for each designated system and component, stating that it will remain in place and operable following the design wind event and comply with requirements of authorities having jurisdiction.
- b. Certification must be based on ICC-ES or similar nationally recognized testing standard procedures acceptable to authorities having jurisdiction.

G. Qualification Statements (as applicable):

1. For qualified regional manufacturer.
2. For electrical professional engineer.
3. For EPM specialist.
4. For welder.
5. For ERMCS-PVC raceway Installer.
6. For medium-voltage cable Installer.
7. For medium-voltage duct Installer.
8. For medium-voltage equipment Installer.
9. For electrical power monitoring Installer.
10. For switchboard Installer.
11. For EVSE Installer.
12. For generator set Installer.
13. For lightning protection system Installer.
14. For theatrical lighting Installer.
15. For exterior athletic lighting Installer.
16. For power quality specialist.
17. For electrical testing and inspecting agency and its on-site electrical testing supervisor.
18. For outdoor pole testing and inspecting agency.
19. For luminaire photometric testing laboratory.
20. For lighting testing and inspecting agency.
21. For communications design professional.
22. For communications cable Installer.
23. For communications testing and inspecting agency and its on-site communications testing supervisor.
24. For nurse call/code blue system Installer.
25. For security design professional.
26. For fire-alarm system design professional.
27. For mass notification design professional.
28. For IB-PSC design professional.
29. For emergency communications design professional.
30. For fire-alarm cable Installer and its on-site fire-alarm cable installation supervisor.
31. For security testing and inspecting agency and its on-site security testing supervisor.
32. For fire-alarm testing agency and its on-site fire-alarm testing supervisor.

1.9 CLOSEOUT SUBMITTALS

A. Facility EMP Binders:

1. Complete Set: On approved online solution.
2. Volumes 2 and 8: Reproducible hardcopy on archival quality, 28 lb, acid-free, bond paper if required by AHJ.

B. Operation and Maintenance Data:

1. Provide emergency operation, normal operation, and preventive maintenance manuals for each system, equipment, and device:
2. Include the following information:
 - a. Manufacturer's operating specifications.
 - b. User's guides for software and hardware.
 - c. Schedule of maintenance material items recommended to be stored at the Project site.
 - d. Detailed instructions covering operation under both normal and abnormal conditions.
 - e. Time-current curves for overcurrent protective devices and manufacturer's written instructions for testing and adjusting their settings.
 - f. List of load-current and overload-relay heaters with related motor nameplate data.
 - g. List of lamp types and photoelectric relays used on the Project, with ANSI and manufacturers' codes.
 - h. Manufacturer's instructions for setting field-adjustable components.
 - i. Manufacturer's instructions for testing, adjusting, and reprogramming microprocessor controls.
 - j. EPSS: Manufacturer's system checklists, maintenance schedule, and maintenance log sheets in accordance with NFPA 110.
 - k. Exterior pole inspection and repair procedures.

C. Software and Firmware Operational Documentation: Provide software and firmware operational documentation, including the following:

1. Software operating and upgrade manuals.
2. Names, versions, and website addresses for locations of installed software.
3. Device address list.
4. Printout of software application and graphic screens.
5. Testing and adjusting of panic and emergency power features.
6. For lighting controls, include the following:
 - a. Adjustments of scene preset controls, adjustable fade rates, and fade overrides.
 - b. Operation of adjustable zone controls.

D. Software:

1. Provide to City upgrades and unrestricted licenses for Government use for installed and backup software, including operating systems and programming tools required for operation and maintenance.

1.10 MOCKUPS

A. Simple Mockups for Coordinating Accessibility of Electrical Devices around Fixed Furnishings and Equipment:

1. Build simple mockups when necessary for verification of general arrangement, actual dimensions, and accessibility prior to fabrication and installation of Work. Depict

products from all Divisions requiring coordination, including, but not limited to, fixed furnishings, casework, outlet covers and plates, HVAC controls, exposed raceway, exposed plumbing, equipment, and signage.

- B. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless City specifically approves such deviations by Change Order.

PART 2 - PRODUCTS

2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT

- A. Substitution requests for electrical equipment will be entertained under the following conditions:
 - 1. Substitution requests may be submitted for consideration prior to the Electrical Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for City throughout life of facility.
 - 2. Substitution requests may be submitted for consideration concurrently with submission of power system study reports when those reports indicate that substitution is necessary for safety of maintenance personnel and facility occupants.
 - 3. Contractor is responsible for sequencing and scheduling power system studies and electrical equipment procurement. After the Electrical Preconstruction Conference, insufficient lead time for electrical equipment delivery will not be considered a valid reason for substitution.

2.2 SUBSTITUTION LIMITATIONS FOR COMMUNICATIONS EQUIPMENT

- A. Substitution requests for communications equipment will be entertained under the following conditions:
 - 1. Substitution requests may be submitted for consideration prior to the Communications Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for City throughout life of facility.
 - 2. Contractor is responsible for sequencing and scheduling equipment procurement. After the Communications Preconstruction Conference, insufficient lead time for equipment delivery will not be considered a valid reason for substitution.

2.3 SUBSTITUTION LIMITATIONS FOR ELECTRONIC SAFETY AND SECURITY EQUIPMENT

- A. Substitution requests for electronic safety and security equipment will be entertained under the following conditions:
 - 1. Substitution requests may be submitted for consideration prior to the Electronic Safety and Security Preconstruction Conference if accompanied by value analysis data

- indicating that substitution will comply with the Project performance requirements while significantly increasing value for City throughout life of facility.
2. Contractor is responsible for sequencing and scheduling equipment procurement. After the Electronic Safety and Security Preconstruction Conference, insufficient lead time for equipment delivery will not be considered a valid reason for substitution.

2.4 FACILITY ELECTRICAL MAINTENANCE PROGRAM (EMP) BINDERS

- A. Description: Set of binders containing operation and maintenance data for facility's electrical equipment that was compiled during analysis of installed electrical Work for Facility EMP development.
- B. Applicable Standards:
 1. Regulatory Requirements: Comply with requirements in NFPA 70B.
 2. General Characteristics:
 - a. Volume 1 - Introduction:
 - 1) Summarize how Facility EMP analysis was performed, how data were collected, and how volumes are organized.
 - 2) Describe Facility EMP and provide recommended policies and procedures for implementing the program and keeping it current.
 - 3) Provide place for City to identify contact information for employees responsible for implementing and maintaining Facility EMP.
 - b. Volume 2 - Facility Safety, Hazards Awareness, and Emergency Procedures:
 - 1) Include training requirements for employees and contractors.
 - 2) Include list of known facility hazards impacting IT&R activities.
 - 3) Include approval and permitting procedures for IT&R activities.
 - 4) Include incident emergency response procedures.
 - 5) Include emergency shutdown procedures.
 - 6) Include electrical disaster recovery procedures.
 - 7) Include procedures for investigating the following incidents:
 - a) Electrical safety incidents.
 - b) Equipment malfunctions.
 - c) Unintended operations or alarms.
 - d) Operation of protective devices.
 - c. Volume 3 - Operating Procedures for Electrical Equipment and Controls:
 - d. Volume 4 - Facility Diagrams and Schedules:
 - 1) Include single-line diagrams.
 - 2) Include grounding and bonding diagrams.
 - 3) Include essential wiring diagrams.
 - 4) Include system automation diagrams (SCADA, BMS, lighting, HVAC, etc.).
 - 5) Include records of switchgear, switchboard, and panelboard schedules.
 - 6) Include time-current curves for overcurrent protective devices.

- 7) Include list of load-current and overload-relay heaters with related motor nameplate data.
- e. Volume 5 - Inventory of Facility Equipment Using Electrical Power:
 - 1) Include simplified floor plans showing equipment locations.
 - 2) Identify critical equipment (electrical or otherwise).
 - 3) Include identifying designations and nameplate data.
 - 4) Include warranty and maintenance contract information.
- f. Volume 6 - Inventory of Facility Tools, Supplies, and Personnel Protective Equipment:
 - 1) Include schedules of maintenance material items recommended to be stored at facility.
 - 2) Include list of lamp types and photoelectric relays used in facility with ANSI and manufacturers' codes.
 - 3) Include calibration and servicing data for each item.
- g. Volume 7 - Inspection, Testing, and Repair (IT&R) Plan:
 - 1) Include tables showing frequency of activities for each item.
 - 2) Include annual schedule with activities mapped to specific days of the year.
 - 3) Include exterior pole inspection and repair procedures.
- h. Volume 8 - Inspection, Testing, and Repair (IT&R) Forms:
- i. Volume 9 - Inspection, Testing, and Repair (IT&R) Procedures:
- j. Volume 10 - Spare Parts List:
 - 1) Include list of all parts required to perform IT&R procedures.
 - 2) Identify quantities of which parts are recommended to be stored on-site.
 - 3) Include source contact information and budget cost for each item.
- k. Volume 11 - Construction Project Closeout Record Documentation:
 - 1) Include records of power system studies and photometric studies.
 - 2) Include records of risk assessment studies.
 - 3) Include records of electrical system startup and commissioning activities.
 - 4) Include records of baseline inspections and tests.
 - 5) Include records of baseline infrared photographs with normal light photographs showing the location, direction, angle, and conditions necessary for reproducing each infrared photograph.
 - 6) Include records of baseline settings for adjustable equipment and devices.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

- B. Preinstallation Testing:
- C. Evaluation and Assessment:

3.2 PREPARATION

- A. Protection of In-Place Conditions:

3.3 DEVELOPMENT OF FACILITY ELECTRICAL MAINTENANCE PROGRAM (EMP)

- A. Facility EMP must be developed by qualified EMP specialist.
- B. Conduct Facility EMP analysis in accordance with NFPA 70B requirements.
 - 1. Renovation Projects:
 - a. Facility diagrams must include connected existing equipment for entire facility where known. Areas of uncertainty should be clearly indicated.
 - b. Obtain copies of existing operation and maintenance data and existing Facility EMP information from City.
 - c. Facility EMP analysis should identify existing equipment that does not have available operation and maintenance data, and should explain City's risks because this equipment is not included in Facility EMP.
 - d. Data for existing equipment outside scope of the Project may be inserted in Facility EMP Binders without analysis.
 - e. Data for existing equipment impacted by scope of the Project should be analyzed and documented similar to the Project's new equipment data as much as possible.
- C. Compile operation and maintenance data from Facility EMP analysis and submit updated Facility EMP Binders.

3.4 INSTALLATION OF ELECTRICAL WORK

- A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of electrical Work on the Project. Consult Electrical Engineer and/or City for resolution of conflicting requirements.

3.5 CLEANING

- A. Electrical or Electronic Waste Management:

3.6 CLOSEOUT ACTIVITIES

- A. Training:
 - 1. Train City's maintenance personnel on the following topics:

- a. How to implement Facility EMP.
2. Allow City to record training sessions.

END OF SECTION

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:

1. Section 018116 "Facility Environmental Requirements" specifies basis-of-design environmental conditions and performance criteria that are applicable to product selection and installation of the Work on the Project.
2. Section 018123 "Facility Seismic and Wind Criteria" specifies basis-of-design seismic and wind criteria for nonstructural components on the Project.
3. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.
4. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding referenced by this Section.
5. Section 260533.13 "Conduits for Electrical Systems" specifies installation of raceways referenced by this Section.

1.2 DEFINITIONS

- A. NICET:** National Institute for Certification in Engineering Technologies; a division of the National Society of Professional Engineers (NSPE).

1.3 ACTION SUBMITTALS

- A. Product Schedule:** Indicate type, use, location, and termination locations.
- B. Product Data:** For each type of product.
- C. Field quality-control reports.**

1.4 INFORMATIONAL SUBMITTALS

- A. Manufacturer's published instructions.**
- B. Field Reports:**
1. Field reports for infrared scanning.

1.5 QUALIFICATIONS

- A. Electrical Power Testing (EPT) Technician III: Possessing active NICET EPT Level III certification. Able to manage switching procedures, to conduct tests of complex equipment, to analyze test and equipment data, to plan a job, and to lead a team. Has experience performing NFPA 70B, IEEE, and NETA electrical tests.
- B. Electrical Power Testing (EPT) Technician IV: Possessing active NICET EPT Level IV certification. Able to conduct tests of complex metering and relay systems; to evaluate tests, test equipment, test results, and power system performance; to recommend actions to maintain or improve system performance; and to lead multi-team projects.
- C. Electrical Power Testing and Inspecting Agency: Entities possessing active credentials from qualified electrical testing laboratory recognized by authorities having jurisdiction.
 - 1. On-site electrical testing supervisors must possess active NICET EPT Technician III certification.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 THERMOPLASTIC-INSULATED WIRE

- A. Description: Thermoplastic-insulated wire for use in accordance with Article 310 of NFPA 70.

2.3 THERMOSET-INSULATED WIRE

- A. Description: Thermoset-insulated wire for use in accordance with Article 310 of NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders:
 - 1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
 - 2. Copper for feeders smaller than No. 6 AWG; copper, aluminum, or copper-clad aluminum for feeders No. 6 AWG and larger. Conductors must be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits:

1. Material: Copper.
 - a. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
 - b. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
 - C. ASD Output Circuits Cable: Extra-flexible stranded for all sizes.
 - D. PV Circuits: Copper; Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS
- A. Service Entrance: Type XHHW-2, single conductors in raceway.
 - B. Exposed Feeders: Type XHHW-2, single conductors in raceway.
 - C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
 - D. Feeders in Cable Tray: Type THHN/THWN-2, single conductors in raceway and Type XHHW-2, single conductors larger than No. 1/0 AWG
 - E. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
 - F. Branch Circuits in Cable Tray: Type THHN/THWN-2, single conductors in raceway and Type XHHW-2, single conductors larger than No. 1/0 AWG.
 - G. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless steel, wire-mesh, strain relief device at terminations to suit application.
 - H. PV Circuits, Type USE-2: For PV source circuits rated at 600 V or less.
 - I. PV Circuits, Type PV: For PV source circuits rated at 1000 V.
- 3.3 INSTALLATION OF LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
- A. Comply with manufacturer's published instructions.
 - B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:
 1. Electrical Construction: ICC IBC, ICC IFB, NFPA 1, NFPA 70, and NECA NEIS 1.
 2. Electrical Maintenance: NFPA 70B.
 3. Electrical Safety: NFPA 70E.
 4. Temporary Electric Power Work: NECA NEIS 200.
 5. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
 6. Work in Confined Spaces: NFPA 350.

7. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
8. Installation of Type AC and Type MC Cables: NECA NEIS 120.
9. Consult Electrical Engineer and/or City for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
2. Complete raceway installation between conductor and cable termination points prior to pulling conductors and cables.
3. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
4. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
5. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
6. Provide support for cables.
7. Complete cable tray systems installation prior to installing conductors and cables.
8. Connections:
 - a. Tighten electrical connectors and terminals in accordance with manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
 - b. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1) Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
9. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch of slack.

D. Interfaces with Other Work:

1. Identification:
 - a. Identify and color-code conductors and cables.
 - b. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.
2. Sleeves and Sleeve Seals: Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.
3. Firestopping: Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.4 FIELD QUALITY CONTROL

A. Administrator for Electrical Power Tests and Inspections:

1. City will engage qualified electrical testing and inspecting agency to administer and

- perform tests and inspections.
 - 2. Engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
 - 3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
 - 4. Administer and perform tests and inspections with assistance of factory-authorized service representative as needed.
- B. Acceptance Testing Preparation:
- C. Field tests and inspections must be witnessed by City.
- D. Tests and Inspections:
- 1. Perform manufacturer's recommended tests and inspections.
 - 2. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
 - 3. Perform each of the following visual and electrical tests:
 - a. Inspect exposed sections of conductor and cable for physical damage and correct connection in accordance with the single-line diagram.
 - b. Test bolted connections for high resistance using one or more of the following:
 - 1) A low-resistance ohmmeter.
 - 2) Calibrated torque wrench.
 - 3) Thermographic survey.
 - c. Inspect compression-applied connectors for correct cable match and indentation.
 - d. Inspect for correct identification.
 - e. Inspect cable jacket and condition.
 - f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable for a one-minute duration.
 - g. Continuity test on each conductor and cable.
 - h. Uniform resistance of parallel conductors.
- E. Nonconforming Work:
- 1. Wire or cable assembly will be considered defective if it does not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
- F. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.
- 3.5 MAINTENANCE
- A. Infrared Scanning of Splices: Two months after Substantial Completion, perform infrared scan of splices, joints, and connections in conductors 3 AWG and larger. Remove covers so splices,

joints, and connections are accessible to portable scanner. Take visible light photographs at same locations and orientations as infrared scans for documentation to ensure follow-on scans match same conditions for valid comparison. Correct deficiencies determined during the scan.

1. Follow-On Infrared Scanning: Perform follow-up infrared scan of splices at 11 months after Substantial Completion.
2. Instrument: Use infrared-scanning device designed to measure temperature or to detect significant deviations from normal values. Provide documentation of device calibration.
3. Field Reports for Infrared Scanning: Prepare certified report that identifies cables splices checked and that describes scanning results. Include notation of deficiencies detected, remedial actions taken, and scanning observations after remedial action.

END OF SECTION

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:

1. Section 018116 "Facility Environmental Requirements" specifies basis-of-design environmental conditions and performance criteria that are applicable to product selection and installation of the Work on the Project.
2. Section 018123 "Facility Seismic and Wind Criteria" specifies basis-of-design seismic and wind criteria for nonstructural components on the Project.
3. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
 - a. If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
 - b. Listing criteria identified in approval letter must match specified listing criteria. UL label indicating approval of equipment's enclosure is not considered approval of equipment for intended application.
 - c. Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for discontinued or superseded products are unacceptable for submitted product.

B. Shop Drawings: Prepare and submit the following:

1. Plans showing dimensioned locations of grounding features described in "Field Quality Control for Grounding and Bonding" Article, including the following:
 - a. Grounding electrode access enclosures.
 - b. Grounding electrodes.
 - c. Grounding arrangements and connections for separately derived systems.

C. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

- A. Manufacturer's published instructions.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:

1. In addition to items specified in Section 260010 "Supplemental Requirements for Electrical," include the following:
 - a. Plans showing locations of grounding features described in "Field Quality Control for Grounding and Bonding" Article, including the following:
 - 1) Grounding electrode access enclosures.
 - 2) Grounding electrodes.
 - 3) Grounding arrangements and connections for separately derived systems.
 - b. Instructions for periodic testing and inspection of grounding features at test wells grounding connections for separately derived systems based on NFPA 70B.
 - 1) Tests must determine if ground-resistance or impedance values remain within specified maximums, and instructions must recommend corrective action if values do not.
 - 2) Include recommended testing intervals.

1.5 QUALIFICATIONS

- A. Electrical Power Testing (EPT) Technician III: Possessing active NICET EPT Level III certification. Able to manage switching procedures, conduct tests of complex equipment, analyze test and equipment data, plan a job, and lead a team. Has experience performing NFPA 70B, IEEE, and NETA electrical tests.
- B. Electrical Power Testing (EPT) Technician IV: Possessing active NICET EPT Level IV certification. Able to conduct tests of complex metering and relay systems, evaluate tests, test equipment, test results, and power system performance, recommend actions to maintain or improve system performance, and lead multi-team projects.
- C. Electrical Power Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.
 1. On-site electrical testing supervisors must possess active NICET EPT Technician III certification.

1.6 SERVICE CONDITIONS FOR ELECTRICAL EQUIPMENT

- A. Soil Resistivity: Grounding (earthing) Work on the Project must account for soil resistivity conditions specified in Section 018116 "Facility Environmental Requirements."

- B. Electrical and ICT Equipment Grounding (Earthing): Do not exceed 25 Ω resistance to ground (earth).
 - 1. Contact Electrical Engineer and/or City for resolution if 25 Ω specified resistance to ground (earth) is not attained after complying with prescriptive requirements in Article 250 of NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 GROUNDING AND BONDING CONDUCTORS

- A. Equipment Grounding Conductor:
 - 1. Standard Features: 600 V, THWN-2, copper wire or cable, green color, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Isolated Equipment Grounding Conductor:
 - 1. Standard Features: 600 V, THWN-2, copper wire or cable, green color with one or more yellow stripes, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

2.3 GROUNDING AND BONDING CLAMPS

- A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications.

2.4 GROUNDING AND BONDING BUSHINGS

- A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.

2.5 INTERSYSTEM BONDING BRIDGE GROUNDING CONNECTORS

- A. Description: Devices that provide means for connecting communications systems grounding and bonding conductors at service equipment or at disconnecting means for buildings or

structures.

2.6 GROUNDING AND BONDING BUSBARS

- A. Description: Miscellaneous grounding and bonding devices that serve as common connection for multiple grounding and bonding conductors.

2.7 SIGNAL REFERENCE GRIDS

- A. Description: Means for providing low-impedance path to ground over a large area, approximating an equipotential plan, while simultaneously mitigating large current spikes from faults or lightning.

2.8 GROUNDING ELECTRODE ENCLOSURES

- A. Description: Enclosures designed to protect grounding electrodes from damage while providing access for inspection and testing of the grounding system.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.
- B. Inspect test results of grounding system measured at point of electrical service equipment connection.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS

- A. Grounding and Bonding Conductors:
 - 1. Provide solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.
 - 2. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.
 - 3. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, **1/4 inch** in diameter.
 - 4. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.
 - 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; **1-**

6. **5/8 inch** wide and **1/16 inch** thick.
 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; **1-5/8 inch** wide and **1/16 inch** thick.
 8. Underground Grounding Conductors: Install bare copper conductor, refer to electrical design for sizing.
- B. Grounding and Bonding Connectors:
1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 4. Connections to Structural Steel: Welded connectors.
- C. Grounding and Bonding Busbars: Provide in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated on the Drawings.

3.3 INSTALLATION OF GROUNDING AND BONDING

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
 2. Electrical Maintenance: NFPA 70B.
 3. Electrical Safety: NFPA 70E.
 4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
 5. Communications Work: BICSI N1.
 6. Work in ITE Rooms: NFPA 75.
 7. Work in Health Care Facilities: NFPA 99 and Article 517 of NFPA 70.
 8. Emergency and Standby Power Work: NFPA 110, NFPA 111, and NECA NEIS 416.
 9. Work in Confined Spaces: NFPA 350.
 10. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
 11. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
 12. Consult Electrical Engineer and/or City for resolution of conflicting requirements.
- C. Special Techniques:
1. Grounding and Bonding Conductors:
 - a. 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. Underground Grounding Conductors:

- 1) Bury at least 30 inch below grade.
2. Grounding and Bonding Connectors: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
 - a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - b. Make connections with clean, bare metal at points of contact.
 - c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
 - d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 - e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
 - f. 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 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 disconnect-type connection is required, use bolted clamp.
 - g. Grounding and Bonding for Piping:
 - 1) Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use bolted clamp connector or bolt lug-type connector to pipe flange by using one of lug bolts of flange. Where dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2) Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with bolted connector.
 - 3) Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
 - h. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install [tinned] bonding jumper to bond across flexible duct connections to achieve continuity.
 - i. Grounding for Steel Building Structure: Install driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 ft apart.
3. Grounding and Bonding Busbars:

- a. Install busbar horizontally, on insulated spacers 2 inch minimum from wall, 6 inch above finished floor unless otherwise indicated.
 - b. Where busbars are indicated on both sides of doorways, route bonding conductor up to top of door frame, across top of doorway, and down; connect to continuation of horizontal busbar.
4. Electrodes:
- a. Ground Rods: Drive rods until tops are 2 inch 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) Use exothermic welds for below-grade connections.
 - b. For grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least same distance from other grounding electrodes, and connect to service grounding electrode conductor.
 - c. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and must be at least 12 inch deep, with cover.
 - 1) Install at least one test well for each service unless otherwise indicated. Install at ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
 - d. Ring Electrode: Install grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around perimeter of building.
 - 1) Install tinned-copper conductor as indicated in electrical design documents for ring electrode and for taps to building steel.
 - 2) Bury ring electrode not less than 24 inch from building's foundation.
 - e. Concrete-Encased Electrode (Ufer Ground):
 - 1) Fabricate in accordance with NFPA 70; use minimum of 20 ft of bare copper conductor not smaller than 4 AWG.
 - a) If concrete foundation is less than 20 ft long, coil excess conductor within base of foundation.
 - b) Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
 - 2) Fabricate in accordance with NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 ft long. If reinforcing is in multiple pieces, connect together by usual steel tie wires or exothermic welding to

create required length.

5. Grounding at Service:
 - a. Equipment grounding conductors and grounding electrode conductors must be connected to ground busbar. Install main bonding jumper between neutral and ground buses.
6. Grounding Separately Derived Systems:
 - a. Permanent Generators: Install grounding electrode(s) at location of permanent generators having switched neutral connections. Electrode must be connected to equipment grounding conductor and to frame of generator.
7. Grounding Underground Distribution System Components:
 - a. Duct-Bank Grounding Conductor: Bury 12 inch above duct bank when indicated as part of duct-bank installation.
 - b. Comply with IEEE C2 grounding requirements.
 - c. Grounding Manholes and Handholes: Install driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inch will extend above finished floor. If necessary, install ground rod before manhole is placed and provide 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inch above to 6 inch below concrete. Seal floor opening with waterproof, nonshrink grout.
 - d. Pad-Mounted Transformers and Switches: Install two ground rods and ring electrode around pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than 2 AWG for ring electrode and for taps to equipment grounding terminals. Bury ring electrode not less than 6 inch from foundation.
8. Equipment Grounding and Bonding:
 - a. Install insulated equipment grounding conductors with feeders and branch circuits.
 - b. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1) Feeders and branch circuits.
 - 2) Lighting circuits.
 - 3) Receptacle circuits.
 - 4) Single-phase motor and appliance branch circuits.
 - 5) Three-phase motor and appliance branch circuits.
 - 6) Flexible raceway runs.
 - 7) Armored and metal-clad cable runs.
 - 8) Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in switchgear, switchboard, or distribution panel to

- equipment grounding bar terminal on busway.
 - 9) X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.
 - c. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
 - d. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
 - e. Isolated Grounding Receptacle Circuits: Install insulated equipment grounding conductor connected to receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of applicable derived system or service unless otherwise indicated.
 - f. Isolated Equipment Enclosure Circuits: For designated equipment supplied by branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of applicable derived system or service unless otherwise indicated.
 - g. Poles Supporting Outdoor Lighting Fixtures: Bond insulated equipment grounding conductor to equipment grounding terminal inside pole base.
 - h. Metallic Fences: Comply with requirements of IEEE C2.
 - 1) Grounding Conductor: Bare copper, see electrical design documents for conductor size.
 - 2) Gates: Must be bonded to grounding conductor with flexible bonding jumper.
 - 3) Barbed Wire: Strands must be bonded to grounding conductor.
9. Fence Grounding:
- a. Grounding Method: At each grounding location, drive grounding rod vertically until top is 6 inch below finished grade. Connect rod to fence with 6 AWG conductor. Connect conductor to each fence component at grounding location.
 - b. Fences greater than 100 ft of Buildings, Structures, Walkways, and Roadways: Ground fence at maximum intervals of 1500 ft.
 - c. Fences within 100 ft of Buildings, Structures, Walkways, and Roadways: Ground fence at maximum intervals of 750 ft.
 - 1) Gates and Other Fence Openings: Ground fence on each side of opening.
 - a) Bond metal gates to gate posts by connecting bonding jumper between gate post and gate frame.
 - b) Bond across openings, with and without gates, except at openings

indicated as intentional fence discontinuities. Use 2 AWG wire and bury it at least 18 inch below finished grade.

- d. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of power line crossing and at maximum distance of 150 ft on each side of crossing.
- e. Bonding to Lightning-Protection System: If fence terminates at lightning-protected building or structure, ground fence and bond fence grounding conductor to lightning-protection down conductor or lightning-protection grounding conductor, complying with NFPA 780.

3.4 FIELD QUALITY CONTROL FOR GROUNDING AND BONDING

A. Administrant for Electrical Power Tests and Inspections:

- 1. City will engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
- 2. Engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
- 3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
- 4. Administer and perform tests and inspections.

B. Acceptance Testing Preparation:

C. Field tests and inspections must be witnessed by City.

D. Tests and Inspections:

- 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
- 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench in accordance with manufacturer's published instructions.
- 3. Test completed grounding system at each location where maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by 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 in accordance with IEEE Std 81.
 - c. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Electrical Engineer and/or City promptly and include recommendations to reduce ground resistance.

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

E. Nonconforming Work:

1. Grounding system will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective components and retest.

F. Collect, assemble, and submit test and inspection reports.

1. Report measured ground resistances that exceed the following values:
 - a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 Ω .
 - b. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 Ω .
 - c. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 Ω .
 - d. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 Ω .
 - e. Substations and Pad-Mounted Equipment: 5 Ω .
 - f. Manhole Grounds: 10 Ω .

3.5 PROTECTION

- A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by City.

END OF SECTION

SECTION 260533.13
CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:

1. Section 018116 "Facility Environmental Requirements" specifies temperature, humidity, acoustical, and other field conditions applicable to the Work specified in this Section.
2. Section 018123 "Facility Seismic and Wind Criteria" specifies seismic hazard, wind hazard, other structural load design conditions applicable to the Work specified in this Section.
3. Section 260010 "Supplemental Requirements for Electrical" specifies additional coordination, scheduling, sequencing, submittal, and installation requirements applicable to the Work for electrical, communications, and electronic safety and security systems on the Project, including wiring methods.
4. Section 260519 "Low-Voltage for Electrical Power Conductors and Cables" specifies nonmetallic underground conduit with conductors (Type NUCC).
5. Section 260543 "Underground Ducts and Raceways for Electrical Systems" specifies exterior duct banks, manholes, and underground utility construction.

1.2 REFERENCES

A. Abbreviations and Acronyms for Electrical Raceway Types:

1. EMT: Electrical metallic tubing.
2. EMT-A: Aluminum electrical metallic tubing.
3. EMT-S: Steel electrical metallic tubing.
4. EMT-SS: Stainless steel electrical metallic tubing.
5. ENT: Electrical nonmetallic tubing.
6. EPEC: Electrical HDPE underground conduit (thin wall).
7. ERMCM: Electrical rigid metal conduit.
8. FMC: Flexible metal conduit.
9. FMT: Steel flexible metallic tubing.
10. FNMC: Flexible nonmetallic conduit. See "LFNC."
11. HDPE: HDPE underground conduit (thick wall).
12. IMC: Steel electrical intermediate metal conduit.
13. LFMC: Liquidtight flexible metal conduit.
14. LFNC: Liquidtight flexible nonmetallic conduit.
15. PVC: Rigid PVC conduit.
16. PVC-40: Schedule 40 rigid PVC conduit.
17. PVC-80: Schedule 80 rigid PVC Conduit.
18. RGS: See ERMCM-S-G.
19. RMC: See ERMCM.
20. RTRC: Reinforced thermosetting resin conduit.

B. Definitions:

1. Conduit: A structure containing one or more duct raceways.
2. Direct Buried: Installed underground without encasement in concrete or other protective material.
3. Duct Bank: An arrangement of conduit providing one or more continuous duct raceways between two points.
4. Duct Raceway: A single enclosed raceway for conductors or cable.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

- A. Manufacturer's published instructions.

1.5 QUALIFICATIONS

- A. Electrical Power Testing (EPT) Technician III: Possessing active NICET EPT Level III certification. Able to manage switching procedures; conduct tests of complex equipment; analyze test and equipment data; plan a job; and lead a team. Has experience performing NFPA 70B, IEEE, and NETA electrical tests.
- B. Electrical Power Testing (EPT) Technician IV: Possessing active NICET EPT Level IV certification. Able to conduct tests of complex metering and relay systems; evaluate tests, test equipment, test results, and power system performance; recommend actions to maintain or improve system performance; and lead multi-team projects.
- C. Electrical Power Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

PART 3 - EXECUTION

3.1 SELECTION OF CONDUITS FOR ELECTRICAL SYSTEMS

- A. Unless more stringent requirements are specified in the Contract Documents or manufacturer's published instructions, comply with NFPA 70 for selection of duct raceways. Consult Electrical Engineer and/or City for resolution of conflicting requirements.
- B. Special Instructions Regarding HDPE Conduits: Although Article 353 of NFPA 70 permits use of HDPE conduits where encased in concrete aboveground, UL CCN EAZX listing requirements state that HDPE and EPEC underground conduits are intended only for use where direct buried with or without being encased in concrete. Specified Type HDPE and Type EPEC underground conduits are not permitted to be used aboveground on the Project.
- C. Outdoors:
 - 1. Exposed and Subject to Severe Physical Damage: ERM C.
 - 2. Exposed and Subject to Physical Damage: ERM C.
 - 3. Exposed and Not Subject to Physical Damage: PVC-80.
 - 4. Concealed Aboveground: PVC-40.
 - 5. Direct Buried: PVC-40.
 - 6. Concrete Encased Not in Trench: PVC-40.
 - 7. Concrete Encased in Trench: PVC-40.
 - 8. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFM C.
- D. Indoors:
 - 1. Hazardous Classified Locations: ERM C.
 - 2. Exposed and Subject to Severe Physical Damage: ERM C.
 - 3. Exposed and Subject to Physical Damage: ERM C.
 - 4. Exposed and Not Subject to Physical Damage: PVC-80.
 - 5. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 6. Damp or Wet Locations: IM C.
 - 7. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FM C.
- E. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
 - 1. ERM C and IM C: Provide threaded-type fittings unless otherwise indicated.

3.2 INSTALLATION OF CONDUITS FOR ELECTRICAL SYSTEMS

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Safety: NFPA 70E.
3. Commissioning of Active and Passive Fire Protection Features: NFPA 3 and NFPA 4.
4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
5. Communications Work: BICSI N1.
6. Life Safety and Means of Egress Work: NFPA 101.
7. Emergency and Standby Power Work: NFPA 110, NFPA 111, and NECA NEIS 416.
8. Work in Confined Spaces: NFPA 350.
9. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
10. Type EMT-A: Article 358 of NFPA 70 and NECA NEIS 102.
11. Type EMT-SS: Article 358 of NFPA 70 and NECA NEIS 101.
12. Type EMT-S: Article 358 of NFPA 70 and NECA NEIS 101.
13. Type ENT: Article 362 of NFPA 70 and NECA NEIS 102.
14. Type HDPE and Type EPEC: Article 353 of NFPA 70 and NECA NEIS 111.
15. Type ERMC-A: Article 344 of NFPA 70 and NECA NEIS 102.
16. Type ERMC-SS: Article 344 of NFPA 70 and NECA NEIS 101.
17. Type ERMC-S: Article 344 of NFPA 70 and NECA NEIS 101.
18. Type FMC-S: Article 348 of NFPA 70 and NECA NEIS 101.
19. Type FMC-A: Article 348 of NFPA 70 and NECA NEIS 102.
20. Type FMT: Article 360 of NFPA 70 and NECA NEIS 101.
21. Type IMC: Article 342 of NFPA 70 and NECA NEIS 101.
22. Type LFMC: Article 350 of NFPA 70 and NECA NEIS 101.
23. Type LFNC: Article 342 of NFPA 70 and NECA NEIS 111.
24. Type PVC: Article 356 of NFPA 70 and NECA NEIS 111.
25. Type RTRC: Article 355 of NFPA 70 and NECA NEIS 111.
26. Expansion Fittings: NEMA FB 2.40.
27. Consult Electrical Engineer and/or City for resolution of conflicting requirements.

C. Special Installation Techniques:

1. General Requirements for Installation of Duct Raceways:
 - a. Complete duct raceway installation before starting conductor installation.
 - b. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft above finished floor.
 - c. Install no more than equivalent of three 90-degree bends in conduit run . Support within 12 inch of changes in direction.
 - d. Make bends in duct raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
 - e. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
 - f. Support conduit within 12 inch of enclosures to which attached.
 - g. Install duct sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed duct raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install duct sealing fittings in accordance with NFPA 70.
 - h. Install devices to seal duct raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of

environments. Seal interior of duct raceways at the following points:

- 1) Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2) Where an underground service duct raceway enters a building or structure.
 - 3) Conduit extending from interior to exterior of building.
 - 4) Conduit extending into pressurized duct raceway and equipment.
 - 5) Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
 - 6) Where otherwise required by NFPA 70.
- i. Do not install duct raceways or electrical items on "explosion-relief" walls or rotating equipment.
 - j. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
 - k. Keep duct raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal duct raceway runs above water and steam piping.
 - l. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
 - m. Install pull wires in empty duct raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground duct raceways designated as spare above grade alongside duct raceways in use.
 - n. Install duct raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
 - 1) Termination fittings with shoulders do not require two locknuts.
 - o. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
2. Types ERMC and IMC:
 - a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of duct raceway and fittings before making up joints. Follow compound manufacturer's published instructions.
 3. Types FMC, LFMC, and LFNC:
 - a. Provide a maximum of 36 inch of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 4. Types PVC, HDPE, and EPEC:
 - a. Do not install Type PVC, Type HDPE, or Type EPEC conduit where ambient

- temperature exceeds 122 deg F. Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
- b. Comply with manufacturer's published instructions for solvent welding and fittings.
 - c. Join joints with solvent cement in accordance with manufacturer's published instructions and allowed to cure before handling. Joints to be bent, pushed, or pulled must set for minimum 24 h after joining.
5. Type RTRC: Do not install Type RTRC conduit where ambient temperature exceeds 230 deg F.
6. Duct Raceways Embedded in Slabs:
- a. Arrange duct raceways to cross building expansion joints with expansion fittings at right angles to the joint.
 - b. Arrange duct raceways to ensure that each is surrounded by minimum of 1 inch of concrete without voids.
 - c. Do not embed threadless fittings in concrete unless locations have been specifically approved by Electrical Engineer and/or City.
 - d. Change from ENT to PVC-80 before rising above floor.
7. Stub-ups to Above Recessed Ceilings:
- a. Provide EMT, IMC, or ERM C for duct raceways.
 - b. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
8. Duct Raceway Terminations at Locations Subject to Moisture or Vibration:
- a. Provide insulating bushings to protect conductors, including conductors smaller than 4 AWG. Install insulated throat metal grounding bushings on service conduits.
9. Duct Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.
- a. ERM C-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 - b. EMT: Provide [**setscrew**][**compression**], [**steel**][**cast-metal**] fittings. Comply with NEMA FB 2.10.
 - c. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.
10. Identification: Provide labels for conduit assemblies, duct raceways, and associated electrical equipment.
- a. Provide warning signs.
- D. Interfaces with Other Work:

1. Firestop penetrations of fire-rated floor and wall assemblies.
2. Provide conduit hangers and supports.
3. Coordinate installation of new products for Insert system or product family/category.

3.3 FIELD QUALITY CONTROL OF CONDUITS FOR ELECTRICAL SYSTEMS

A. Administrant for Electrical Power Tests and Inspections:

1. City will engage qualified medium-voltage electrical testing and inspecting agency to administer and perform tests and inspections.
2. Engage qualified medium-voltage electrical testing and inspecting agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
4. Administer and perform tests and inspections.

B. Acceptance Testing Preparation:

C. Field tests and inspections must be witnessed by City.

D. Tests and Inspections:

1. Perform manufacturer's recommended tests and inspections.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide minimum 12 inch long mandrel equal to duct size minus 1/4 inch. If obstructions are indicated, remove obstructions and retest.
3. Conduit Placement:
 - a. Verify that center-line location and offsets are in accordance with the Drawings.
 - b. Verify that hangers and supports for conduits are attached to structure as directed by qualified structural engineer.
 - c. Verify that nuts on bolts or hanger rods are secure.
 - d. Verify that space between raceways and cored holes are filled with non-shrinking grout or other approved material indicated on the Drawings and the Specifications.
 - e. Verify that expansion devices are installed at locations indicated on the Drawings and the Specifications.
 - f. Verify that ends are cut square to provide flush-butting surfaces when spliced and inside edges are free of burrs that could impede installation of cables.
 - g. Verify minimum separation of utilities, or that approved mechanical protection has been provided to surrounding conduit(s) where minimum separation cannot be achieved.
4. Document all changes on Record Drawings.

E. Nonconforming Work:

1. Conduit will be considered defective if it does not pass tests and inspections.

2. Remove and replace defective units and retest.

F. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

3.4 CLEANING

A. Verify that bentonite or other drilling fluids are contained and removed, and site is restored to its original or improved condition.

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 260533.16
BOXES AND COVERS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:

1. Section 018116 "Facility Environmental Requirements" specifies temperature, humidity, acoustical, and other field conditions applicable to the Work specified in this Section.
2. Section 018123 "Facility Seismic and Wind Criteria" specifies seismic hazard, wind hazard, other structural load design conditions applicable to the Work specified in this Section.
3. Section 260010 "Supplemental Requirements for Electrical" specifies additional coordination, scheduling, sequencing, submittal, and installation requirements applicable to the Work for electrical, communications, and electronic safety and security systems on the Project, including wiring methods.
4. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding referenced by this Section.

1.2 DEFINITIONS

- A. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
- B. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
1. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
 2. Concrete Box: A box intended for use in poured concrete.
 3. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
 4. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
 5. Cover Plate: A cover designed for protecting wiring devices installed in flush-mounted device boxes while permitting their safe operation; also called a faceplate or wallplate.
 6. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
 7. Device Box: A box with provisions for mounting a wiring device directly to the box.
 8. Extension Ring: A ring intended to extend the sides of an outlet box or device box to

- increase the box depth, volume, or both.
9. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
 10. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
 11. Floor Nozzle: An enclosure used on a wiring system, intended primarily as a housing for a receptacle, provided with a means, such as a collar, for surface-mounting on a floor, which may or may not include a stem to support it above the floor level, and is sealed against the entrance of scrub water at the floor level.
 12. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
 13. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
 14. Pedestal Floor Box Cover: A floor box cover that, when installed as intended, provides a means for typically vertical or near-vertical mounting of receptacle outlets above the floor's finished surface.
 15. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
 16. Raised-Floor Box: A floor box intended for use in raised floors.
 17. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.
 18. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.
 19. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
 20. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
 21. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.
- C. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
- D. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of product requiring samples for source quality control.
- C. Shop Drawings: Prepare and submit the following:
 1. Shop Drawings for Floor Boxes: Show that floor boxes are located to avoid interferences and are structurally allowable. Indicate floor thickness at location where boxes are embedded in concrete floors and underfloor clearances where boxes are installed in raised floors.

D. Sustainable Design Submittals:

1. Product data for sustainable design features for each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Manufacturer's published instructions.

1.5 QUALIFICATIONS

- A. Electrical Power Testing (EPT) Technician III: Possessing active NICET EPT Level III certification. Able to manage switching procedures; conduct tests of complex equipment; analyze test and equipment data; plan a job; and lead a team. Has experience performing NFPA 70B, IEEE, and NETA electrical tests.
- B. Electrical Power Testing (EPT) Technician IV: Possessing active NICET EPT Level IV certification. Able to conduct tests of complex metering and relay systems; evaluate tests, test equipment, test results, and power system performance; recommend actions to maintain or improve system performance; and lead multi-team projects.
- C. Inspection and Testing of Fire-Alarm Systems (I&TFAS) Technician I: Possessing active NICET I&TFAS Level I certification. Able to perform periodic inspections and tests of basic fire-alarm systems and prepare related records and reports.
- D. Inspection and Testing of Fire-Alarm Systems (I&TFAS) Technician II: Possessing active NICET I&TFAS Level II certification. Able to plan, perform, and coordinate periodic inspections and tests of complex fire-alarm systems (including one or more of suppression interfaces, networked control units, smoke control interfaces, air sampling systems, multi-zone voice evacuation systems, or high-rise applications) and prepare related records and reports.
- E. Electrical Power Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.
- F. Communications Testing and Inspecting Agency: Entity possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.
- G. Security Testing and Inspecting Agency: Entity possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.
- H. Fire-Alarm Testing Agency: Entity possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and

marked for intended location and application.

2.2 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Source Quality Control:

1. Samples:

- a. Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
- b. Raised Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
- c. Recessed Access-Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
- d. Concrete Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.

2.3 NONMETALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Source Quality Control:

1. Samples:

- a. Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
- b. Raised Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
- c. Recessed Access-Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
- d. Concrete Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.

PART 3 - EXECUTION

3.1 SELECTION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Electrical Engineer and/or City for resolution of conflicting requirements.

B. Degree of Protection:

1. Outdoors:

- a. Type 3R unless otherwise indicated.
- b. Locations Exposed to Hosedown: Type 6P.
- c. Locations Subject to Potential Flooding: Type 6P.
- d. Locations Aboveground Where Mechanism Must Operate When Ice Covered: Type 3S.
- e. Locations in-Ground or Exposed to Corrosive Agents: Type 4X.
- f. Locations in-Ground or Exposed to Corrosive Agents Where Mechanism Must Operate When Ice Covered: Type 3SX.

2. Indoors:

- a. Type 1 unless otherwise indicated.
- b. Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
- c. Flush Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12K.
- d. Locations Exposed to Hosedown: Type 6P.
- e. Locations Exposed to Corrosive Agents: Type 4X.

C. Exposed Boxes Installed Less Than 2.5 m (8 ft) Above Floor:

- 1. Provide cast-metal boxes.
- 2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.2 INSTALLATION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

- 1. Electrical Construction: ICC IBC, ICC IFB, NFPA 1, NFPA 70, and NECA NEIS 1.
- 2. Electrical Safety: NFPA 70E.
- 3. Commissioning of Active and Passive Fire Protection Features: NFPA 3 and NFPA 4.
- 4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
- 5. Communications Work: BICSI N1.
- 6. Life Safety and Means of Egress Work: NFPA 101.
- 7. Emergency and Standby Power Work: NFPA 110, NFPA 111, and NECA NEIS 416.
- 8. Work in Confined Spaces: NFPA 350.
- 9. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
- 10. Outlet, Device, Pull, and Junction Boxes: Article 314 of NFPA 70.
- 11. Consult Electrical Engineer and/or City for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
2. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
3. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.
4. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
5. Locate boxes so that cover or plate will not span different building finishes.
6. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
7. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
8. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
9. Set metal floor boxes level and flush with finished floor surface.
10. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
11. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.
12. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
13. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:
 - a. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
 - b. Provide gaskets for cover plates and covers.

D. Interfaces with Other Work:

1. Identification: Provide labels for boxes and associated electrical equipment.
 - a. Identify field-installed conductors, interconnecting wiring, and components.
 - b. Label each enclosure with engraved metal or laminated-plastic nameplate.
 - c. Provide warning signs and arc-flash hazard warning labels for electrical equipment.

3.3 FIELD QUALITY CONTROL OF BOXES AND COVERS

A. Administrator for Electrical Power Tests and Inspections:

1. City will engage qualified medium-voltage electrical testing and inspecting agency to administer and perform tests and inspections.
2. Engage qualified medium-voltage electrical testing and inspecting agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.

4. Administer and perform tests and inspections.
- B. Administrant for Communications Tests and Inspections:
1. City will engage qualified communications testing and inspecting agency to administer and perform tests and inspections.
 2. Engage qualified communications testing and inspecting agency to administer and perform tests and inspections.
 3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
 4. Administer and perform tests and inspections.
- C. Administrant for Security Tests and Inspections:
1. City will engage qualified security testing and inspecting agency to administer and perform tests and inspections.
 2. Engage qualified security testing and inspecting agency to administer and perform tests and inspections.
 3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
 4. Administer and perform tests and inspections.
- D. Administrant for Fire-Alarm Tests and Inspections:
1. City will engage qualified fire-alarm testing and inspecting agency to administer and perform tests and inspections.
 2. Engage qualified fire-alarm testing and inspecting agency to administer and perform tests and inspections.
 3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
 4. Administer and perform tests and inspections.
- E. Field tests and inspections must be witnessed by City.
- F. Tests and Inspections:
1. Perform manufacturer's recommended tests and inspections.
 2. Perform tests and inspections recommended by standards listed in "Reference Standards for Installation" Paragraph.
- G. Nonconforming Work:
1. Boxes and covers will be considered defective if they do not pass tests and inspections.
 2. Remove and replace defective units and retest.
- H. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

3.4 CLEANING

- A. Remove construction dust and debris from boxes before installing cover plates, covers, and hoods.

3.5 PROTECTION

- A. After installation, protect boxes from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by City.

END OF SECTION

SECTION 260543
UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 013100 "Project Management and Coordination" specifies preinstallation conference procedures.
3. Section 260519 "Low-Voltage for Electrical Power Conductors and Cables" specifies nonmetallic underground conduit with conductors (Type NUCC).

1.2 DEFINITIONS

- A. Duct: A single raceway or multiple raceways, installed singly or as components of a duct bank.
- B. Duct Bank: Two or more ducts installed in parallel, direct buried or with additional casing materials such as concrete.
- C. Handhole: An underground chamber containing electrical cables, sized such that personnel are not required to enter in order to access the cables.
- D. Manhole: An underground chamber containing electrical cables and equipment, sized to provide access with working space clearances.
- E. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site or via virtual meeting.
- B. Preinstallation Coordination Meeting(s): For underground ducts and raceways. Conduct meeting(s) before excavating, saw cutting, or trenching.
 1. Attendees: Installers, fabricators, representatives of manufacturers, and administrators for field tests and inspections. Notify all necessary parties of scheduled meeting dates.

1.4 ACTION SUBMITTALS

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

1. For concrete and steel used in precast concrete manholes and handholes, also include product certificates as required by ASTM C858.

B. Shop Drawings:

1. Electric Utility Duct Banks and Structures:
 - a. Include plans, elevations, sections, and details, including attachments to other Work.
 - b. Indicate locations of private property boundaries and utility easements.
 - c. Include information required for approval by electric utility and for obtaining public space utility work permits.
2. Precast or Factory-Fabricated Concrete Structures:
 - a. Include plans, elevations, sections, and details, including attachments to other Work.
 - b. Include duct entry provisions, including locations and duct sizes, and methods and materials for waterproofing duct entry locations.
 - c. Include reinforcement details.
 - d. Include frame and cover design and manhole chimneys.
 - e. Include ladder and/or step details.
 - f. Include grounding details.
 - g. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, sumps, and other accessories.
 - h. Include joint details.
3. 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 locations and duct sizes, and methods and materials for waterproofing duct entry locations.
 - c. Include cover design.
 - d. Include grounding details.
 - e. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and other accessories.

C. Field quality-control reports.

1.5 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- B. Field Reports:
 1. Factory Test Reports: For handholes and boxes.
 2. Manufacturer's field reports for field quality-control support.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Spare Parts: Furnish to City spare parts necessary for repairing or adding more cables to manholes or handholes that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Cable-Support Stanchions, Arms, and Associated Fasteners: Five percent of quantity of each item installed.
 - 2. Insulators: Five percent of quantity of each item installed.

1.7 REGULATORY AGENCY APPROVALS

- A. Shop Drawing submittals for electric utility duct banks and structures must be signed and sealed by qualified electrical professional engineer responsible for their preparation. Obtain approval by electric utility prior to submitting for action by Electrical Engineer and/or City.
- B. Submit Shop Drawings for electric utility duct banks and structures for action by Electrical Engineer and/or City prior to submitting for approval by electric utility.

PART 2 - PRODUCTS

2.1 TYPE EPEC RACEWAYS AND FITTINGS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL 651A and UL CCN EAZX.

2.2 TYPE IMC RACEWAYS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL 1242 and UL CCN DYBY.

2.3 TYPE PVC RACEWAYS AND FITTINGS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL 651 and UL CCN DZYR.

2.4 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

2.5 SOLVENT CEMENTS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: As recommended by conduit manufacturer in accordance with UL 514B and UL CCN DWTT.
3. Sustainability Characteristics:

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics:
 - a. ASTM C858 for design and manufacturing processes.
 - b. SCTE 77.

2.7 MANHOLES FOR EXTERIOR UNDERGROUND WIRING

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics:
 - a. ASTM C858 for design and manufacturing processes.
 - b. SCTE 77.

B. Cast-in-Place Concrete Manholes:

1. Description: Underground utility structures, constructed in place, complete with accessories, hardware, and features. Include concrete knockout panels for duct entrance and sleeve for ground rod.
2. Additional Criteria: Comply with Section 033000 "Cast-in-Place Concrete."

2.8 SOURCE QUALITY CONTROL

A. Factory Tests for Handholes and Boxes:

1. Testing Administrant: Engage qualified structural testing agency to evaluate handholes and boxes.
 - a. Tests of materials must be performed by independent testing agency.
 - b. Strength tests of complete boxes and covers must be by independent testing agency or manufacturer. Qualified registered professional engineer must certify tests by manufacturer.
2. Factory Tests and Inspections: Perform the following tests and inspections on handholes and boxes, by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, before delivering to site. Affix label with name and date of manufacturer's certification of system compliance.
 - a. Precast Concrete Utility Structures: Test and inspect in accordance with ASTM C1037.
 - b. Polymer Concrete and Nonconcrete Handhole and Pull-Box Prototypes: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests must be for specified tier ratings of products supplied. Testing machine pressure gages must have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.
3. Nonconforming Work:
 - a. Equipment that does not pass tests and inspections will be considered defective.
4. Factory Test Reports: Prepare and submit factory test and inspection reports.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in field. Notify Electrical Engineer and/or City if there is conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, 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 and duct bank will drain to manholes and handholes, and as approved by Electrical Engineer and/or City.
- C. Clear and grub vegetation to be removed, and protect vegetation to remain in accordance with Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication in accordance with Section 311000 "Site Clearing."

3.2 SELECTION OF UNDERGROUND DUCTS

- A. Duct for Electrical Cables More Than 600 V: PVC-40, concrete encased unless otherwise indicated.
- B. Duct for Electrical Feeders 600 V and Less: PVC-40, direct buried unless otherwise indicated.
- C. Duct for Electrical Branch Circuits: PVC-40, direct buried unless otherwise indicated.
- D. Underground Ducts Crossing Paved Paths Walks and Driveways: PVC-40 direct buried.
- E. Stub-ups: Concrete encased, PVC-40.

3.3 SELECTION OF UNDERGROUND ENCLOSURES

- A. Handholes and Boxes:
 - 1. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
 - 2. Units in Sidewalk and Similar Applications with Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
 - 3. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested in accordance with SCTE 77 with **3000 lbf** vertical loading.
 - 4. Cover design load must not exceed load rating of handhole or box.
- B. Manholes: Precast or cast-in-place concrete.
 - 1. Units Located in Roadways and Other Deliberate Traffic Paths by Heavy or Medium Vehicles: H-20 structural load rating in accordance with AASHTO HB 17.
 - 2. Units Not Located in Deliberate Traffic Paths by Heavy or Medium Vehicles: H-10 load rating in accordance with AASHTO HB 17.

3.4 EARTHWORK

- A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restoration: Restore area after construction vehicle traffic in immediate area is complete.
- C. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- D. 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."
- E. Cut and patch existing pavement in path of underground duct, duct bank, and underground structures in accordance with "Cutting and Patching" Article in Section 017300 "Execution."

3.5 INSTALLATION OF DUCTS AND DUCT BANKS

A. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA TCB 2 for installation of underground ducts and duct banks.
2. Consult Electrical Engineer and/or City for resolution of conflicting requirements.

B. Special Techniques:

1. Where indicated on Drawings, install duct, spacers, and accessories into duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
2. Steel raceway, bends, and fittings in single duct run or duct bank must be of same type.
3. Slope: Pitch duct minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from high point between two manholes to drain in both directions.
4. Expansion and Deflection Fittings: Install expansion and deflection fitting in each duct in area of disturbed earth adjacent to manhole or handhole.
5. Install expansion fitting near center of straight line duct with calculated expansion of more than **3/4 inch**.
6. Curves and Bends:
 - a. Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with minimum radius of 12.5 ft, both horizontally and vertically, at other locations unless otherwise indicated.
 - b. Field bending must be in accordance with NFPA 70 minimum radii requirements, except bends over 45 degrees must be made with minimum radius of 12.5 ft. Use only equipment specifically designed for material and size involved. Use PVC heating bender for bending PVC conduit.
 - c. Duct must have maximum of 180 degrees of bends between pull points.
7. Joints: Use solvent-cemented joints in nonmetallic duct and fittings and make watertight in accordance with manufacturer's published instructions. Stagger couplings so those of adjacent duct do not lie in same plane. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with minimum 3 inch of concrete for minimum of 12 inch on each side of coupling.
 - a. Install insulated grounding bushings on steel raceway terminations that are less than 12 inch below grade or floor level and do not terminate in hubs.
8. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing duct will not be subject to environmental temperatures above 104 deg F. Where environmental temperatures are calculated to rise above 104 deg F, and anywhere duct crosses above underground steam line, install insulation blankets listed for direct burial to isolate duct bank from steam line to maintain maximum environmental temperature of 104 deg F.

9. End Bell Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inch o.c. for 5 inch duct, and vary proportionately for other duct sizes.
 - a. Begin change from regular spacing to end-bell spacing 10 ft from end bell, without reducing duct slope and without forming trap in line.
 - b. Grout end bells into structure walls from both sides to provide watertight entrances.
10. Duct Terminators for Entrances to Cast-in-Place Manholes and Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inch o.c. for 4 inch duct, and vary proportionately for other duct sizes.
 - a. Begin change from regular spacing to terminator spacing 10 ft from terminator, without reducing duct line slope and without forming trap in line.
11. Building Wall Penetrations: Make transition from underground duct to steel raceway at least 10 ft outside building wall, without reducing duct line slope away from building and without forming trap in line. Use fittings manufactured for transition to steel raceway type installed. Install steel raceway penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
12. Install manufactured steel raceway elbows for stub-ups at poles unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
 - a. Couple steel elbows to ducts with adapters designed for this purpose, and encase coupling with minimum 3 inch of concrete for minimum of 12 inch on each side of coupling.
13. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15 psig hydrostatic pressure.
14. Pulling Cord: Install 200 lbf test nylon cord in empty ducts.
15. Concrete-Encased Ducts and Duct Bank:
 - a. Excavate trench bottom to provide firm and uniform support for duct. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes 6 inch or less in nominal diameter.
 - b. Width: Excavate trench 3 inch wider than duct on each side.
 - c. Depth: Install so top of duct envelope is at least 24 inch below finished grade in areas not subject to deliberate traffic, and at least 30 inch below finished grade in deliberate traffic paths for vehicles unless otherwise indicated. Install so top of duct envelope is below local frost line.
 - d. Support duct on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
 - e. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 ft of duct. Place spacers within

24 inch of duct ends. Stagger spacers approximately 6 inch between tiers. Secure spacers to earth and to duct to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

- f. Minimum Space between Ducts: 3 inch between edge of duct and exterior envelope wall, 2 inch between ducts for like services, and 4 inch between power and communications ducts.
- g. Elbows:
 - 1) Use manufactured duct elbows for stub-ups and at changes of direction in duct unless otherwise indicated. Extend encasement throughout length of elbow.
 - 2) Use manufactured steel elbows for stub-ups, at building entrances, and at changes of direction in duct run.
- h. Stub-ups to Outdoor Equipment: Extend concrete-encased steel raceway horizontally minimum of 60 inch from edge of equipment base.
 - 1) Stub-ups must be minimum 4 inch above finished floor and minimum 3 inch from conduit side to edge of slab.
- i. Stub-ups to Indoor Equipment: Extend concrete-encased steel raceway horizontally minimum of 60 inch from edge of wall. Install insulated grounding bushings on terminations at equipment.
 - 1) Stub-ups must be minimum 4 inch above finished floor and no less than 3 inch from conduit side to edge of slab.
- j. Reinforcement: Reinforce concrete-encased duct where crossing disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
- k. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
- l. Concrete Cover: Install minimum of 3 inch of concrete cover between edge of duct to exterior envelope wall, 2 inch between duct of like services, and 4 inch between power and communications ducts.
- m. Place minimum 6 inch of engineered fill above concrete encasement of duct.
- n. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
 - 1) Start at one end and finish at other, allowing for expansion and contraction of duct as its temperature changes during and after pour. Use expansion fittings installed in accordance with manufacturer's published instructions, or use other specific measures to prevent expansion-contraction damage.
 - 2) If more than one pour is necessary, terminate each pour in vertical plane and install 3/4 inch reinforcing-rod dowels extending minimum of 18 inch into concrete on both sides of joint near corners of envelope.

- o. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between duct and at exterior surface of envelope. Do not allow heavy mass of concrete to fall directly onto ducts. Allow concrete to flow around duct and rise up in middle, uniformly filling open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-installation application.
16. Direct-Buried Duct and Duct Bank:
- a. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inch in nominal diameter.
 - b. Width: Excavate trench 3 inch wider than duct on each side.
 - c. Depth: Install top of duct at least 36 inch below finished grade unless otherwise indicated.
 - d. Set elevation of top of duct bank below frost line.
 - e. Place minimum 3 inch of sand as bed for duct. Place sand to minimum of 6 inch above top level of duct.
 - f. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
 - g. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than five spacers per 20 ft of duct. Place spacers within 24 inch of duct ends. Stagger spacers approximately 6 inch between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
 - h. Install duct with minimum of 3 inch between ducts for like services and 6 inch between power and communications duct.
 - i. Install manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct direction unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
 - j. Install manufactured steel elbows for stub-ups, at building entrances, and at changes of direction in duct.
 - 1) Couple RNC duct to steel raceway with adapters designed for this purpose, and encase coupling with minimum 3 inch of concrete.
 - 2) Stub-ups to Outdoor Equipment: Extend concrete-encased steel raceway horizontally minimum of 60 inch from edge of base. Install insulated grounding bushings on terminations at equipment.
 - a) Stub-ups must terminate in coupling installed flush with finished base and minimum 3 inch from conduit side to edge of base.
 - 3) Stub-ups to Indoor Equipment: Extend concrete-encased steel raceway horizontally on exterior of wall minimum of 60 inch from edge of wall.

- Install insulated grounding bushings on terminations at equipment.
 - 4) Stub-ups through interior floors must be minimum 4 inch above finished floor and no less than 3 inch from conduit side to edge of equipment pad or floor slab.
- k. After installing first tier of duct, 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 inch over duct 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. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.
- 17. Warning Planks: Bury warning planks approximately 12 inch above direct-buried duct, placing them 36 inch o.c. Align planks along width and along centerline of duct or duct bank. Provide additional plank for each 12 inch increment of duct-bank width over nominal 18 inch. Space additional planks 12 inch apart, horizontally across width of ducts.
- 18. Underground-Line Warning Tape: Bury nonconducting underground line specified in Section 260553 "Identification for Electrical Systems" no less than 12 inch above concrete-encased duct and duct banks and approximately 12 inch below grade. Align tape parallel to and within 3 inch of centerline of duct bank. Provide additional warning tape for each 12 inch increment of duct-bank width over nominal 18 inch. Space additional tapes 12 inch apart, horizontally across width of ducts.
- 19. Ground ducts and duct banks in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.6 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Reference Standards:

- 1. Precast Concrete Handholes: Comply with ASTM C891 unless otherwise indicated.
- 2. Consult Electrical Engineer and/or City for resolution of conflicting requirements.

B. Special Techniques:

- 1. Cast-in-Place Manholes:
 - a. Finish interior surfaces with smooth-troweled finish.
 - b. Knockouts for Future Duct Connections: Form and pour concrete knockout panels 1-1/2 to 2 inch thick, arranged as indicated.
 - c. Comply with requirements in Section 033000 "Cast-in-Place Concrete" for cast-in-place concrete, formwork, and reinforcement.
- 2. Precast Concrete Handholes and Manholes:
 - a. Install units level and plumb and with orientation and depth coordinated with

- connecting duct to minimize bends and deflections required for proper entrances.
 - b. Unless otherwise indicated, support units on 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.
 - c. Field-cut openings for conduits in accordance with enclosure manufacturer's published instructions. Cut wall of enclosure with tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- 3. Elevations:
 - a. Manhole Roof: Install with rooftop at least 15 inch below finished grade.
 - b. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch above finished grade.
 - c. Install handholes with bottom below frost line, below grade.
 - d. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
 - e. Where indicated, cast handhole cover frame integrally with handhole structure.
- 4. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.
- 5. Manhole Access: Circular opening in manhole roof; sized to match cover size.
 - a. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.
 - b. Install chimney, constructed of precast concrete collars and rings, and cast-iron frame to connect cover with manhole roof opening. Provide moisture-tight joints and waterproof grouting for frame and chimney.
- 6. Waterproofing: Apply waterproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. Waterproofing materials and installation are specified in. After duct has 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.
- 7. Dampproofing: Apply dampproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. After ducts are connected and grouted, and before backfilling, dampproof joints and connections, and touch up abrasions and scars. Dampproof exterior of manhole chimneys after mortar has cured at least three days.
- 8. Hardware: 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.
- 9. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.
- 10. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inch for manholes and 2 inch for handholes, for anchor bolts installed in field. Use minimum of two anchors for each cable stanchion.
- 11. Ground manholes, handholes, and boxes in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Reference Standards:

1. Consult Electrical Engineer and/or City for resolution of conflicting requirements.

B. Special Techniques:

1. 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 seal joint between box and extension as recommended by manufacturer.
2. Unless otherwise indicated, support units on 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.
3. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.
4. Install handholes and boxes with bottom below frost line, below grade.
5. 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.
6. Field cut openings for duct in accordance with enclosure manufacturer's published instructions. Cut wall of enclosure with tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
7. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour concrete ring encircling, and in contact with enclosure entry, and with top surface screeded to top of box cover frame. Bottom of ring must rest on compacted earth.
 - a. Concrete: 3000 psi, 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with troweled finish.
 - b. Dimensions: Refer to electrical design documents for dimensions.
8. Ground handholes and boxes in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Field tests and inspections must be witnessed by City.

B. Tests and Inspections:

1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide minimum 12 inch long mandrel equal to duct size minus 1/4 inch. If obstructions are indicated, remove obstructions and retest.

3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

C. Nonconforming Work:

1. Underground ducts, raceways, and structures will be considered defective if they do not pass tests and inspections.
2. Correct deficiencies and retest as specified above to demonstrate compliance.

D. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

E. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections as necessary.

1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at Project site.

3.9 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. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump, and building interiors affected by Work.
 1. Sweep floor, removing dirt and debris.
 2. Remove foreign material.

END OF SECTION

SECTION 262726 WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:

1. Section 018116 "Facility Environmental Requirements" specifies temperature, humidity, acoustical, and other field conditions applicable to the Work specified in this Section.
2. Section 018123 "Facility Seismic and Wind Criteria" specifies seismic hazard, wind hazard, and other structural load design conditions applicable to the Work specified in this Section.
3. Section 260010 "Supplemental Requirements for Electrical" specifies additional coordination, scheduling, sequencing, submittal, and installation requirements applicable to the Work for electrical, communications, and electronic safety and security systems on the Project, including wiring methods.
4. Section 013100 "Project Management and Coordination" for preinstallation conference procedures.
5. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding referenced by this Section.
6. Section 260533.16 "Boxes and Covers for Electrical Systems" specifies covers and cover plates referenced by this Section.

1.2 DEFINITIONS

- A. AFCI: Arc-Fault Circuit Interrupter.
- B. Commercial/Industrial-Use Cord Reel: A cord reel subject to severe use in factories, commercial garages, construction sites, and similar locations requiring a harder service-type cord.
- C. GFCI: Ground-Fault Circuit Interrupter.
- D. UL 1472 Type I Dimmer: Dimmer in which air-gap switch is used to energize preset lighting levels.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at or via virtual meeting.

1.4 ACTION SUBMITTALS

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

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
 - a. If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
 - b. Listing criteria identified in approval letter must match specified listing criteria. UL label indicating approval of equipment's enclosure is not considered approval of equipment for intended application.
 - c. Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for discontinued or superseded products are not acceptable for submitted product.
2. Include manufacturer's sample extended warranty language.

B. Samples:

1. One for each kind of toggle switch and cover plate accessory specified, in each finish and color specified.
2. One for each kind of single straight-blade receptacle and cover plate accessory specified, in each finish and color specified.
3. One for each kind of duplex straight-blade receptacle and cover plate accessory specified, in each finish and color specified.
4. One for each kind of receptacle with GFCI device and cover plate accessory specified, in each finish and color specified.

C. Shop Drawings:

1. Wiring diagrams for duplex straight-blade receptacles with integral switching means.

D. Field quality-control reports.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer's published instructions.

B. Field Reports:

1. Manufacturer's field reports for field quality-control support.

1.6 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Extra stock material.

B. Special tools.

1.8 QUALIFICATIONS

- A. Electrical Power Testing (EPT) Technician III: Possessing active NICET EPT Level III certification. Able to manage switching procedures, conduct tests of complex equipment, analyze test and equipment data, plan a job, and lead a team. Has experience performing NFPA 70B, IEEE, and NETA electrical tests.
- B. Electrical Power Testing (EPT) Technician IV: Possessing active NICET EPT Level IV certification. Able to conduct tests of complex metering and relay systems; evaluate tests, test equipment, test results, and power system performance; recommend actions to maintain or improve system performance; and lead multi-team projects.
- C. Electrical Power Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 MAINTENANCE MATERIAL ITEMS FOR STRAIGHT-BLADE RECEPTACLES

- A. Extra Stock Material: Furnish to City extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Special Tools: Furnish to City proprietary equipment, keys, and software required to operate, maintain, repair, adjust, or implement future changes to controlled receptacles, that are packaged with protective covering for storage on-site and identified with labels describing contents.

2.3 MAINTENANCE MATERIAL ITEMS FOR CONNECTORS, CORDS, AND PLUGS

- A. Extra Stock Material: Furnish to City extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Special Tools: Furnish to City proprietary equipment, keys, and software required to operate, maintain, repair, adjust, or implement future changes to cord connectors, that are packaged with protective covering for storage on-site and identified with labels describing contents.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receptacles:

1. Verify that receptacles to be procured and installed for City-furnished equipment are compatible with mating attachment plugs on equipment.

3.2 INSTALLATION OF SWITCHES

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFB, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Safety: NFPA 70E.
3. Life Safety and Means of Egress Work: NFPA 101.
4. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
5. Wiring Devices: NECA NEIS 130.
6. Mounting Heights: NECA NEIS 1.
7. Consult Electrical Engineer and/or City for resolution of conflicting requirements.

C. Interfaces with Other Work:

1. Identification:

- a. Identify cover or cover plate for device with panelboard identification and circuit number.
- b. Mark cover or cover plate using hot, stamped, or engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.
- c. Provide warning signs and arc-flash hazard warning labels for electrical equipment.

3.3 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFB, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Safety: NFPA 70E.
3. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.

4. Work in ITE Rooms: NFPA 75.
5. Work in Health Care Facilities: NFPA 99 and Article 517 of NFPA 70.
6. Work in Confined Spaces: NFPA 350.
7. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
8. Installing and Maintaining Wiring Devices: NECA NEIS 130.
9. Mounting Heights: Unless otherwise indicated in the Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
10. Receptacle Orientation: Unless otherwise indicated in the Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.
 - a. Hospital-Grade Receptacle Orientation: Orient receptacle with ground pin or neutral pin at top.
11. Consult Electrical Engineer and/or City for resolution of conflicting requirements.

C. Interfaces with Other Work:

1. Identification: Provide labels for receptacles and associated electrical equipment.
 - a. Identify field-installed conductors, interconnecting wiring, and components.
 - b. Label each enclosure with engraved metal or laminated-plastic nameplate.
 - 1) Identify cover or cover plate for device with panelboard identification and circuit number.
 - 2) Mark cover or cover plate using hot, stamped, or engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.
 - c. Provide warning signs and arc-flash hazard warning labels for electrical equipment.
2. Do not install Type 3 SPD, including surge-protected relocatable taps and power strips, on branch circuit downstream of GFCI device.

3.4 FIELD QUALITY CONTROL OF SWITCHES

A. Administrant for Electrical Power Tests and Inspections:

1. City will engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
2. Engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
4. Administer and perform tests and inspections.

B. Field tests and inspections must be witnessed by City.

- C. Tests and Inspections:
 - 1. Perform tests and inspections in accordance with manufacturers' published instructions.
- D. Nonconforming Work:
 - 1. Unit will be considered defective if it does not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
- E. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.
- F. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections as necessary.
 - 1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project site.

3.5 FIELD QUALITY CONTROL OF STRAIGHT-BLADE RECEPTACLES

- A. Administrant for Electrical Power Tests and Inspections:
 - 1. City will engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
 - 2. Engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
 - 3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
 - 4. Administer and perform tests and inspections with assistance of factory-authorized service representative.
- B. Field tests and inspections must be witnessed by City.
- C. Tests and Inspections:
 - 1. Insert and remove test plug to verify that device is securely mounted.
 - 2. Verify polarity of hot and neutral pins.
 - 3. Measure line voltage.
 - 4. Measure percent voltage drop.
 - 5. Measure grounding circuit continuity; impedance must be not greater than 2 ohms.
 - 6. Perform additional installation and maintenance inspections and diagnostic tests in accordance with NECA NEIS 130 and manufacturers' published instructions.
- D. Nonconforming Work:
 - 1. Device will be considered defective if it does not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
- E. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

- F. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections as necessary.
 - 1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project site.

3.6 SYSTEM STARTUP FOR SWITCHES

- A. Perform startup service.
 - 1. Complete installation and startup checks in accordance with manufacturer's published instructions.
- B. Manufacturer Services: Engage factory-authorized service representative to support system startup as necessary.
 - 1. Manufacturer's Field Reports for System Startup Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project site.

3.7 PROTECTION

- A. Devices:
 - 1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.
 - 2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by City.
- B. Connectors, Cords, and Plugs:
 - 1. After installation, protect connectors, cords, and plugs from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by City.

END OF SECTION

SECTION 311000 SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.

1.2 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 in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.
- E.** Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.3 PREINSTALLATION MEETINGS

- A.** Preinstallation Conference: Conduct conference at Project site.

1.4 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain City, typical all locations property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or video recordings.
- B. Topsoil stripping and stockpiling program.
- C. Rock stockpiling program.
- D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.
- E. Burning: Documentation of compliance with burning requirements and permitting of authorities having jurisdiction. Identify location(s) and conditions under which burning will be performed.

1.6 QUALITY ASSURANCE

- A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.
- B. Rock Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

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 City and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed trafficways if required by City or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining City's property will be obtained by City before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by City and/or Landscape

Architect, all locations.

- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on City's premises where indicated.
- D. Utility Locator Service: Notify Call Before You Dig for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.
- 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 "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

- A. City will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

3.4 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. Grind down stumps and remove roots larger than 2 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
 - 3. Use only hand methods or air spade for grubbing within protection zones.
 - 4. Chip removed tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and 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. Limit height of topsoil stockpiles to 72 inches.
 - 2. Do not stockpile topsoil within protection zones.

3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for resspreading deeper topsoil.

3.6 STOCKPILING ROCK

- A. Remove from construction area naturally formed rocks that measure more than 1 foot across in least dimension. Do not include excavated or crushed rock.
 1. Separate or wash off non-rock materials from rocks, including soil, clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- B. Stockpile rock away from edge of excavations without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.
 1. Limit height of rock stockpiles to 36 inches.
 2. Do not stockpile rock within protection zones.
 3. Dispose of surplus rock. Surplus rock is that which exceeds quantity indicated to be stockpiled or reused.
 4. Stockpile surplus rock to allow later use by the City.

3.7 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.

3.8 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. Burning tree, shrub, and other vegetation waste is permitted according to burning requirements and permitting of authorities having jurisdiction. Control such burning to produce the least smoke or air pollutants and minimum annoyance to surrounding properties. Burning of other waste and debris is prohibited.
- C. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling

facilities. Do not interfere with other Project work.

END OF SECTION

SECTION 312000 EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Soil materials.
2. Geotextiles.
3. Accessories.

B. Related Requirements:

1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.

1.2 DEFINITIONS

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

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by City and/or Landscape Architect, all locations.
2. Bulk Excavation: Excavation more than 10 ft. in width and more than 30 ft. in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by City and/or Landscape Architect. Unauthorized excavation, as well as remedial work directed by City and/or Landscape Architect, will be without additional compensation.

- G. Fill: Soil materials used to raise existing grades.
- H. Rock:
 - 1. Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
 - 2. Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, in accordance with ASTM D1586/D1586M.
- 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.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct preexcavation conference at Project site.
 - 1. Review methods and procedures related to earthmoving, 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. Field quality control.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of specified product.
- B. Samples for Verification: For the following products, in sizes indicated below:
 - 1. Geotextile: 12 by 12 inches.
 - 2. Warning Tape: 12 inches long; of each color.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Test Reports: For each on-site soil material proposed for fill and backfill as follows:
 - 1. Classification in accordance with ASTM D2487.
 - 2. Laboratory compaction curve in accordance with ASTM D698.
- B. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.
- C. Qualification Statements: For qualified testing agency.

1.6 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified in accordance with ASTM E329 and ASTM D3740 for testing indicated.

1.7 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 City, typical all locations and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by City or authorities having jurisdiction.
- B. Utility Locator Service: Notify "Call Before You Dig" for area where Project is located before beginning earth-moving operations.
- C. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015000 "Temporary Facilities and Controls" and Section 311000 "Site Clearing" are in place.
- D. 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.
- E. Do not direct vehicle or equipment exhaust towards protection zones.
- F. 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: Soil Classification Groups GW, GP, GM, SW, SP, and SM in accordance with ASTM D2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT in accordance with ASTM D2487, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: 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 sieve and zero to 5 percent passing a No. 8 sieve.
- I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.
- J. Sand: ASTM C33/C33M; fine aggregate.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.

PART 3 - EXECUTION

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

- 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:
 - a. 24 inches outside of concrete forms other than at footings.
 - b. 12 inches outside of concrete forms at footings.
 - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 6 inches beneath bottom of concrete slabs-on-grade.
 - f. 6 inches beneath pipe in trenches and the greater of Insert dimension wider than pipe or 42 inches wide.

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

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

3.5 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to **12 inches** higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: As indicated.
- C. Trench Bottoms:
 - 1. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - a. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - b. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of

- trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
 - c. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
 - d. Excavate trenches **6 inches** deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
2. Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
 - a. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.6 SUBGRADE INSPECTION

- A. Notify City and/or Landscape Architect when excavations have reached required subgrade.
- B. If City and/or Landscape Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade 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.
 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by City and/or Landscape Architect, and replace with compacted backfill or fill as directed.
- D. Reconstruct subgrades damaged by rain, accumulated water, or construction activities, as directed by City and/or Landscape Architect, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of **2500 psi**, may be used when approved by City and/or Landscape Architect.
 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by City and/or Landscape Architect.

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 drip line of remaining trees.

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, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring, bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."
- D. Backfill voids with satisfactory soil while removing shoring and bracing.
- E. Initial Backfill:
 - 1. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
 - a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Final Backfill:
 - 1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
- G. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.11 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 walks and pavements, use satisfactory soil material.
2. Under steps and ramps, use engineered fill.
3. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.12 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.13 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 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 in accordance with ASTM D698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top **6 inches** below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.14 GRADING

A. 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. Walks: Plus or minus 1 inch.
2. Pavements: Plus or minus 1/2 inch.

3.15 SUBSURFACE DRAINAGE

- A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a **6-inch** course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 1. Compact each filter material layer to 85 percent of maximum dry unit weight in accordance with ASTM D698 with a minimum of two passes of a plate-type vibratory compactor.
- B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within **12 inches** of final subgrade, in compacted layers **6 inches** thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least **6 inches**.
 1. Compact each filter material layer to 85 percent of maximum dry unit weight in accordance with ASTM D698 with a minimum of two passes of a plate-type vibratory compactor.
 2. Place and compact impervious fill over drainage backfill in **6-inch-** thick compacted layers to final subgrade.

3.16 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base 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. Install separation geotextile on prepared subgrade in accordance with manufacturer's written instructions, overlapping sides and ends.
 2. Place base course material over subbase course under hot-mix asphalt pavement.
 3. Shape subbase course and base course to required crown elevations and cross-slope grades.
 4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
 5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight in accordance with ASTM D698.
- C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight in accordance with ASTM D698.

3.17 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 1. Install subdrainage geotextile on prepared subgrade in accordance with manufacturer's written instructions, overlapping sides and ends.
 2. Place drainage course 6 inches or less in compacted thickness in a single layer.
 3. Place drainage 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.
 4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight in accordance with ASTM D698.

3.18 FIELD QUALITY CONTROL

- A. Special Inspections: City will engage a qualified special inspector to perform the following special inspections:
 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.
- B. Testing Agency: City will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect 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.
- D. 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 City and/or Landscape Architect.

- 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.

3.19 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 City and/or Landscape Architect; 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.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off City's property.
- B. Transport surplus satisfactory soil to designated storage areas on City's property. Stockpile or spread soil as directed by City and/or Landscape Architect.
 - 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off City's property.

END OF SECTION

SECTION 321313 CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes concrete paving including the following:
 - 1. Walks.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for general building applications of concrete.
 - 2. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to concrete paving, including but not limited to, the following:
 - a. Concrete mixture design.
 - b. Quality control of concrete materials and concrete paving construction practices.
 - 2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
 - a. Contractor's superintendent.
 - b. Concrete paving Subcontractor.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each type of product or exposed finish, prepared as Samples of

size indicated below:

- C. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.
- B. Material Certificates: For the following, from manufacturer:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Admixtures.
 - 4. Curing compounds.
 - 5. Applied finish materials.
 - 6. Bonding agent or epoxy adhesive.
 - 7. Joint fillers.
- C. Material Test Reports: For each of the following:
 - 1. Aggregates:
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Ready-Mix-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 according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").
- B. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.
 - 1. Personnel conducting field tests must be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
 - 2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by City and/or Landscape Architect and not less than 96 inches by 96 inches.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless City and/or Landscape Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.8 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with **ACI 301** unless otherwise indicated.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
 - 1. Use flexible or uniformly curved forms for curves with a radius of **100 feet** or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, fabricated from as-drawn galvanized-steel wire into flat sheets.
- B. Reinforcing Bars: ASTM A615/A615M, Grade 60; deformed.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:
 - 1. Portland Cement: ASTM C150/C150M, gray portland cement Type I.
 - 2. Fly Ash: ASTM C618, Class C or Class F.
 - 3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
 - 4. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, portland blast-furnace slag cement.
- B. Normal-Weight Aggregates: ASTM C33/C33M, Class 4S, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Air-Entraining Admixture: ASTM C260/C260M.

- D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 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. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- E. Water: Potable and complying with ASTM C94/C94M.

2.5 CURING MATERIALS

- A. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- B. Water: Potable.

2.6 RELATED MATERIALS

- A. Joint Fillers: ASTM D1751, asphalt-saturated cellulosic fiber in preformed strips.
- B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy-Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements.

2.7 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
 - 2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash or Pozzolan: 25 percent.
 - 2. Slag Cement: 50 percent.
 - 3. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

- C. Limit water-soluble, chloride-ion content in hardened concrete to [**0.15**][**0.30**] percent by weight of cement.
- D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing 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.
- E. Concrete Mixtures: Normal-weight concrete.
 - 1. Compressive Strength (28 Days): 3500 psi.
 - 2. Maximum W/C Ratio at Point of Placement: 0.50.
 - 3. Slump Limit: 4 inches, plus or minus **1 inch**.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M . Furnish batch certificates for each batch discharged and used in the Work.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
 - 1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
 - 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000 "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 INSTALLATION OF STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
 - 2. Provide tie bars at sides of paving strips where indicated.
 - 3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 4. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of as indicated on drawings.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
 - a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut **1/8-inch-** wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 - a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- C. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- D. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

- E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- F. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
- G. Screed paving surface with a straightedge and strike off.
- H. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
 - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
 - 3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface **1/16 to 1/8 inch** deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least **12 inches**,

and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.

3.9 PAVING TOLERANCES

A. Comply with tolerances in **ACI 117** and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-feet- long; unlevelled straightedge not to exceed 1/2 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch.
6. Vertical Alignment of Dowels: 1/4 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.10 FIELD QUALITY CONTROL

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

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C172/C172M will be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M; 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. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is **40 deg F** and below and when it is **80 deg F** and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C31/C31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C39/C39M; test one specimen at seven days and two specimens at 28 days.

- a. A compressive-strength test to be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if 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**.
- D. Test results to be reported in writing to City and/or Landscape Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests to contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by City and/or Landscape Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency will 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 City and/or Landscape Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

3.11 REPAIR AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by City and/or Landscape Architect.
- B. Drill test cores, where directed by City and/or Landscape Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 321373
CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1. Joint-sealant backer materials.
2. Primers.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data:
 1. Concrete pavement joint sealants.
 2. Joint-sealant backer materials.
- B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of joint sealant.
- C. Samples for Verification: Actual sample of finished products for each kind and color of joint sealant required.
 1. Size: Joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Paving-Joint-Sealant Schedule: Include the following information:
 1. Joint-sealant application, joint location, and designation.
 2. Joint-sealant manufacturer and product name.
 3. Joint-sealant formulation.
 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For Installer and testing agency.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 1. Installers: Entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Testing: Performed by a qualified testing agency.

1.7 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain joint sealants from single manufacturer for each sealant type.

2.2 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backer materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.3 JOINT-SEALANT BACKER MATERIALS

- A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.
- D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.4 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

- A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions.
- C. Install joint-sealant backers to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of joint-sealant backer materials.
 - 2. Do not stretch, twist, puncture, or tear joint-sealant backer materials.
 - 3. Remove absorbent joint-sealant backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install joint sealants immediately following backer material installation, using proven

techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants in accordance with the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
1. Remove excess joint sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

- A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.
- B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.5 PAVING-JOINT-SEALANT SCHEDULE

- A. Joints within Concrete Paving:
1. Joint Location:
 - a. Expansion and isolation joints in concrete paving.
 - b. Contraction joints in concrete paving.
 - c. Other joints as indicated.
 2. Joint Sealant: Single-component, nonsag, silicone joint sealant.
 3. Joint-Sealant Color: Manufacturer's standard.

END OF SECTION

**SECTION 323300
SITE FURNISHINGS**

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts cast in concrete footings.
2. Section 312000 "Earth Moving" for excavation for installing concrete footings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Samples for Initial Selection: For units with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish, not less than 6-inch- long linear components and 4-inch- square sheet components.
- E. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For site furnishings manufactured with preservative-treated wood.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to be included in maintenance manuals.

PART 2 - PRODUCTS

2.1 SHADE STRUCTURE

- A. Basis of Design Product: Subject to compliance with requirements, provide shade structure from the following company:
 1. Manufacturer: As indicated on Drawings or approved equal.
 2. Color: As indicated on Drawings.

2.2 MATERIALS

- A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M; recommended in writing by manufacturer, for exterior applications.
- B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.

2.3 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPAC M4 to cut surfaces.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- F. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.4 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.6 STEEL AND GALVANIZED-STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.
- B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

2.7 IRON FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.8 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run directional finishes with long dimension of each piece.
 - 2. Directional Satin Finish: ASTM A480/A480M, No 4.
 - 3. Dull Satin Finish: ASTM A480/A480M, No. 6.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.
- F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

END OF SECTION

SECTION 330500

COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Excavation, trenching, bedding, backfill, compaction, and surface restoration for underground utility installations as shown on the Improvement Plans.
- B. Related Requirements:
 - 1. Section 33 16 13.19 – Plastic Aboveground Water Utility Storage Tank.
 - 2. Section 33 11 16 – Site Water Utility Distribution Piping.
 - 3. Section 33 12 23 – Water Utility Pumping Stations.
 - 4. Section 33 31 00 – Sanitary Utility Sewerage Piping.
 - 5. Section 33 36 13 – Utility Septic Tank and Effluent Wet Wells.
 - 6. Section 33 36 16.16 – Utility Septic Tank Effluent Pump Package.
 - 7. Section 33 36 33 – Utility Septic Tank Drainage Field.

1.2 REFERENCES

- A. All earthwork and underground utility construction shall conform to the City of Los Banos Improvement Standards, latest edition (hereinafter “City Standards”), including but not limited to the following:
 - 1. Division 2, Section 220 – Earthwork.
 - 2. Division 5, Section 510 – Pipelines, General.
- B. California Labor Code Section 6500 and applicable regulations of the California Division of Occupational Safety and Health (Cal/OSHA) pertaining to excavation and trenching.
- C. Merced County Environmental Health Department standards and permit conditions for the Onsite Wastewater Treatment System (OWTS), as applicable to work within the OWTS system envelope.

1.3 SUBMITTALS

- A. Submit the following in accordance with the Contract Documents:
 - 1. Shoring and trench safety plan, where excavations exceed 5 feet in depth, prepared by a California-registered Civil or Structural Engineer, prior to commencement of excavation, in accordance with City Standards Section 510-2.1.
 - 2. Cal/OSHA permit required under California Labor Code Section 6500, where applicable.
 - 3. Pipe and pipe joint product data for City review, prior to purchase, per City Standards

PART 2 - PRODUCTS

2.1 BEDDING AND BACKFILL MATERIALS

- A. Pipe Bedding: Per City Standards and as shown on the Improvement Plans.
- B. Trench Backfill: Suitable native material free from heavy gravel, stones greater than 3 inches in maximum dimension, organic material, or debris, in accordance with City Standards Section 510-2.8.
- C. Water for compaction: Free of deleterious substances.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions, grades, and utility locations before commencing excavation. Notify the Engineer of Record of conditions that differ materially from those shown on the Improvement Plans.
- B. Prior to commencing excavation, Contractor shall contact Underground Service Alert (USA) at 811 to verify the absence of underground utilities in the work area.

3.2 EXCAVATION AND TRENCHING

- A. Perform all excavation and trenching in accordance with City Standards Division 2, Section 220, and Division 5, Section 510, and applicable Cal/OSHA requirements. Trench safety is the sole responsibility of the Contractor.
- B. Trench Width: Maximum allowable trench width measured at the top of pipe shall be the outside diameter of the pipe plus 24 inches, per City Standards Section 510-2.3. Minimum clearance of 6 inches shall be maintained between pipe and trench wall.
- C. Grade and Alignment: Establish and verify alignment and grade for trench bottom prior to excavation and obtain approval of the Engineer of Record before laying pipe, per City Standards Section 510-2.2.
- D. Dewatering: Remove water from excavations by draining or pumping, in accordance with City Standards Section 220-2.1, so that pipe laying and compaction operations are performed in dry conditions.

3.3 PIPE INSTALLATION

- A. Lay and joint all pipe in accordance with manufacturer's recommendations and City Standards Section 510-2.5. Close exposed pipe ends with a suitable plug when pipe laying is not in progress.
- B. Curves and Bends: Comply with City Standards Section 510-2.6. Joint deflection shall not exceed 80 percent of the manufacturer's recommendation.
- C. Fittings: Furnish and install all fittings as shown on the Improvement Plans per City Standards Section 510-2.7. Submit shop drawings for fabricated fittings prior to fabrication.

3.4 BACKFILL AND COMPACTION

- A. Perform backfill and compaction in accordance with City Standards Division 2, Section 220, and Division 5, Section 510-2.8, and as shown on the Improvement Plans and Standard Details.
- B. Do not drop backfill material directly on pipe. Backfill placed within 6 inches of the pipe shall be free from heavy gravel or stones greater than 3 inches in maximum dimension, per City Standards Section 510-2.8.
- C. Place backfill at approximately the same elevation on both sides of the pipe. Do not displace pipe from alignment during backfilling operations.
- D. Compaction: Comply with the requirements of City Standards Section 220, the Geotechnical Engineering Investigation prepared by Krazan & Associates, Inc. (Project No. 012-25193, dated October 14, 2025), and the Improvement Plans. In the event of conflict between these documents, the Geotechnical Report recommendations shall govern.

3.5 SURFACE RESTORATION

- A. Restore all disturbed surfaces to pre-construction condition or better, in accordance with City Standards and the Improvement Plans.
- B. Native Soil Areas: Grade disturbed areas to match the surrounding existing grades. Re-establish any disturbed drainage patterns.
- C. Excess excavated material and unsuitable material shall become the property of the Contractor and shall be legally disposed of off-site, per City Standards Section 220-2.2.

3.6 FIELD QUALITY CONTROL

- A. Compaction Testing: Compaction testing shall be performed in accordance with the Geotechnical Engineering Investigation prepared by Krazan & Associates, Inc. (Project No. 012-25193, dated October 14, 2025). Laboratory maximum soil density (dry) shall be determined in accordance with ASTM D1557 for cohesive materials. Relative density for cohesionless materials shall be determined in accordance with ASTM D2049.

- B. The Contractor shall cooperate with the Engineer of Record and Soils Engineer, and shall provide access to all work areas for inspection and testing.

END OF SECTION

SECTION 331116

SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing and installing potable water distribution piping, fittings, valves, pressure relief valve, and appurtenances from the water storage tank to the modular restroom, as shown on the Improvement Plans.
- B. Related Sections:
 - 1. Section 33 05 00 – Common Work Results for Utilities.
 - 2. Section 33 16 13.19 – Plastic Aboveground Water Utility Storage Tank.
 - 3. Section 33 12 23 – Water Utility Pumping Stations.

1.2 REFERENCES

- A. The following standards and references apply to this Section:
 - 1. City of Los Banos Improvement Standards, latest edition – Division 5, Section 510 (Pipelines, General) and Section 513 (Water Service Pipelines).
 - 2. ASTM D2241 – Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
 - 3. ASTM D2672 – Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement.
 - 4. ASTM D2564 – Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
 - 5. NSF/ANSI 61 – Drinking Water System Components – Health Effects.
 - 6. AWWA C651 – Disinfecting Water Mains.

1.3 SUBMITTALS

- A. Submit the following in accordance with the Contract Documents prior to installation:
 - 1. Product data for pipe, fittings, solvent cement, ball valves, and pressure relief valve, including manufacturer's installation instructions and NSF/ANSI 61 certification documentation.
 - 2. Pipe data sheets per City Standards Section 510-1, prior to purchase.

PART 2 - PRODUCTS

2.1 PIPE

- A. Potable Water Distribution Pipe: Polyvinyl Chloride (PVC) pressure-rated pipe, Class 160 (SDR 26), conforming to ASTM D2241. Pipe shall be NSF/ANSI 61 certified for potable water service and shall be clearly marked with the NSF-pw designation.
- B. Pipe size shall be as shown on the Improvement Plans.

2.2 FITTINGS

- A. Fittings: Schedule 40 or Schedule 80 PVC, conforming to ASTM D2466 or ASTM D2467 respectively, NSF/ANSI 61 certified. Fittings shall include tees, reducers, elbows, and couplings as shown on the Improvement Plans and as required for a complete installation.
- B. Fitting schedule and type shall be as recommended by the pipe manufacturer and as shown on the Improvement Plans.

2.3 JOINTS

- A. Joints: Solvent weld, in accordance with ASTM D2672, using solvent cement conforming to ASTM D2564. Solvent cement shall be NSF/ANSI 61 certified and compatible with potable water service. Joint preparation and application shall be per manufacturer's written instructions.

2.4 VALVES AND APPURTENANCES

- A. Ball Valves: Full-port ball valves, rated for potable water service, NSF/ANSI 61 certified. Valves shall be sized to match connecting pipe diameter as shown on the Improvement Plans. Materials, pressure rating, and end connections shall be per manufacturer's recommendations and compatible with PVC piping system.
- B. Pressure Relief Valve (PRV): Spring-loaded, inline pressure relief valve installed on the booster pump discharge piping, set at 125 psi. PRV shall be NSF/ANSI 61 certified for potable water service. Body material, end connections, and pressure rating shall be per manufacturer's recommendations and compatible with the piping system. Discharge from the PRV shall be piped to a safe, non-erosive location.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that trench grades, alignments, and subgrade conditions are acceptable prior to installation. Notify the Engineer of Record of conditions that differ materially from those shown on the Improvement Plans.

3.2 INSTALLATION

- A. General: Install all piping, fittings, valves, and appurtenances in accordance with the Improvement Plans, City Standards Division 5 Section 510 and Section 513, and manufacturer's written instructions. Excavation, bedding, backfill, and compaction shall conform to Section 33 05 00 – Common Work Results for Utilities.
- B. Tracer Wire: Install a continuous #12 AWG, single strand, tinned copper tracer wire along the bottom of the trench adjacent to all buried water piping, per City Standards Section 513-2.4. Tracer wire shall be continuous between valve boxes and accessible at each valve box.
- C. Solvent Weld Joints: Prepare and assemble joints per manufacturer's written instructions and ASTM D2564. Allow adequate cure time before pressurizing the system. Do not backfill over joints until sufficient cure time has elapsed per manufacturer's recommendations.
- D. Pressure Relief Valve: Install PRV inline on the booster pump discharge piping at the location shown on the Improvement Plans. Install per manufacturer's written instructions. Pipe PRV discharge to a safe, non-erosive location.
- E. This system is a private potable water distribution system not connected to the City water main. City Standards Section 513-3 requirements for connection to existing City water mains do not apply.

3.3 FIELD QUALITY CONTROL

- A. Pressure Testing: Hydrostatically test all buried water distribution piping after backfilling but prior to final surface restoration, per City Standards Section 513-4 and Section 560-4. Test pressure shall be 150 psi, maintained for two hours. Leakage shall not exceed the allowable limit per the formula in City Standards Section 560-4. Repair any detectable leaks and retest until acceptable.
- B. Disinfection: Disinfect all potable water piping prior to placing in service, in accordance with AWWA C651. Collect a minimum of three bacteriological samples over a 24-hour period and submit results to the Engineer of Record. System shall not be placed in service until satisfactory bacteriological test results are obtained.
- C. The Contractor shall cooperate with the Engineer of Record and shall provide access to all work areas for inspection and testing.

END OF SECTION

SECTION 331223

WATER UTILITY PUMPING STATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing and installing one (1) packaged booster pump station for potable water pressure boosting from the water storage tank to the modular restroom, including all appurtenances, concrete mounting pad, and electrical service connection, as shown on the Improvement Plans.
- B. Related Sections:
 - 1. Section 33 05 00 – Common Work Results for Utilities.
 - 2. Section 33 11 16 – Site Water Utility Distribution Piping.
 - 3. Section 33 16 13.19 – Plastic Aboveground Water Utility Storage Tank.

1.2 REFERENCES

- A. The following standards and references apply to this Section:
 - 1. NSF/ANSI 61 – Drinking Water System Components – Health Effects.
 - 2. NFPA 70 – National Electrical Code (NEC).
 - 3. 2022 California Electrical Code (CEC).
 - 4. City of Los Banos Improvement Standards, latest edition – Division 5, Section 513 (Water Service Pipelines).

1.3 SUBMITTALS

- A. Submit the following to the Engineer of Record for review and approval prior to installation:
 - 1. Product data for booster pump station including manufacturer's specifications, performance curves, electrical data, installation instructions, and NSF/ANSI 61 certification documentation.
 - 2. Wiring diagram showing electrical connections, GFCI circuit requirements, and float switch interlock wiring.
 - 3. Operation and Maintenance (O&M) manual for booster pump station.

PART 2 - PRODUCTS

2.1 PACKAGED BOOSTER PUMP STATION

- A. Basis of Design: Grundfos CMBE 1-44 I-X-C-B-D-E compact booster pump system, or approved equal. Unit shall be NSF/ANSI 61 certified (CULUS DW NSF61) for potable water service.
- B. Performance Requirements:
 - 1. Design Flow: 4.5 US GPM minimum.
 - 2. Design Head: 60 feet minimum.
 - 3. Maximum Operating Pressure: 145 psi.
- C. Packaged Unit Components: The booster pump station shall be a factory-assembled package including as a minimum the following:
 - 1. CME pump with integrated variable frequency drive (VFD) and pressure sensor for constant pressure operation.
 - 2. Five-way valve.
 - 3. Expansion tank (2-liter minimum).
 - 4. Pressure gauge.
 - 5. Integrated return (check) valve.
- D. Motor and Electrical: 1 HP, 120VAC/1PH, 60Hz motor with built-in frequency converter. Enclosure class IP55. Motor shall include thermal protection against overloading and blocking per IEC 34.11: TP 211. Electrical service shall be 1 x 115V, 20-Amp GFCI circuit.
- E. Materials: Pump housing and impeller shall be stainless steel AISI 304 (EN 1.4301). Wetted rubber components shall be EPDM, NSF/ANSI 61 compatible.
- F. Pipe Connections: 1-inch NPT inlet and outlet connections.

2.2 CONCRETE MOUNTING PAD

- A. Provide a concrete mounting pad for the booster pump station. Pad dimensions, thickness, and anchor bolt layout shall be as shown on the Improvement Plans. Concrete shall be a minimum 2,500 psi compressive strength at 28 days. Subgrade preparation shall comply with the Geotechnical Engineering Investigation prepared by Krazan & Associates, Inc. (Project No. 012-25193, dated October 14, 2025) and Section 33 05 00 – Common Work Results for Utilities.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade conditions at the pump pad location are acceptable prior to construction.

Notify the Engineer of Record of any soft, unstable, or unsuitable subgrade conditions encountered.

- B. Verify that the water storage tank, suction piping, and electrical service are complete and ready before installing and commissioning the booster pump station and water circulation mixer.

3.2 INSTALLATION

- A. General: Install booster pump station in accordance with manufacturer's written installation instructions and as shown on the Improvement Plans.
- B. Mounting: Secure pump station to concrete mounting pad per manufacturer's recommendations. Unit is intended for outdoor installation. Contractor shall provide adequate protection from direct sunlight and precipitation during installation and prior to system startup.
- C. Piping Connections: Connect suction piping from tank outlet and discharge piping to the restroom water supply in accordance with Section 33 11 16 – Site Water Utility Distribution Piping and as shown on the Improvement Plans.
- D. Electrical: Provide 120VAC/1PH, 20-Amp GFCI electrical service to the booster pump station in accordance with NFPA 70, the 2022 California Electrical Code. Electrical work shall be performed by a licensed electrical contractor.
- E. Float Switch Interlock: Wire the tank-mounted float switch specified in Section 33 16 13.19 - Plastic Aboveground Water Utility Storage Tank to simultaneously interrupt power to the booster pump station and water circulation mixer upon detection of low water level in the tank. The system shall automatically reset and resume normal operation when the float switch detects that water level has recovered to the normal operating range. Wiring and interlock shall be per manufacturer's written instructions.
- F. Low-Level Alarm: Provide a visual alarm indicator (pilot light) at the pump station enclosure to indicate a low-water-level shutdown condition. Pilot light shall be illuminated whenever the float switch has interrupted power to the pump and mixer. Pilot light shall be rated for outdoor use, clearly visible in daylight, and labeled "LOW WATER LEVEL". Alarm shall reset automatically when the low-level condition clears and normal operation resumes.

3.3 FIELD QUALITY CONTROL

- A. Startup and Testing: Prior to placing the system in service, perform startup and operational testing of the booster pump station in accordance with manufacturer's written instructions. Verify the following:
 - 1. Pump operates at design flow and pressure.
 - 2. Constant pressure control functions correctly under varying flow conditions.
 - 3. Float switch low-level interlock disables pump and mixer as intended.
 - 4. GFCI circuit functions correctly.
 - 5. Low-level alarm pilot light illuminates upon low water level shutdown and extinguishes upon auto-reset.
 - 6. No leaks at suction or discharge connections.

- B. Submit a written startup and test report to the Engineer of Record upon completion.
- C. The Contractor shall cooperate with the Engineer of Record and shall provide access to all work areas for inspection and testing.

END OF SECTION

SECTION 331613.19

PLASTIC ABOVEGROUND WATER UTILITY STORAGE TANK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing and installing one (1) above-ground polyethylene potable water storage tank, including all fittings, venting, screened vent, water circulation mixer, float switch, seismic anchorage, and concrete foundation pad, as shown on the Improvement Plans.
- B. Related Sections:
 - 1. Section 33 05 00 – Common Work Results for Utilities.
 - 2. Section 33 11 16 – Site Water Utility Distribution Piping.
 - 3. Section 33 12 23 – Water Utility Pumping Stations.

1.2 REFERENCES

- A. The following standards and references apply to this Section:
 - 1. NSF/ANSI 61 – Drinking Water System Components – Health Effects.
 - 2. 2022 California Building Code (CBC) – Seismic design requirements.
 - 3. ACI 318 – Building Code Requirements for Structural Concrete, for concrete foundation pad design.
 - 4. Geotechnical Engineering Investigation, Krazan & Associates, Inc., Project No. 012-25193, dated October 14, 2025 – for foundation design parameters.

1.3 SUBMITTALS

- A. Submit the following to the Engineer of Record for review and approval prior to fabrication or installation:
 - 1. Product data for tank including manufacturer's specifications, dimensions, fitting configurations, NSF/ANSI 61 certification, and installation instructions.
 - 2. Product data for seismic anchor kit including anchor straps, hardware specifications, and manufacturer's installation instructions.
 - 3. Structural Engineering Package: Design and construction drawings for the concrete foundation pad and seismic anchorage system, prepared, signed, and stamped by a licensed Structural Engineer. Package shall be submitted to and approved by the Engineer of Record prior to construction. Package shall address site-specific geotechnical conditions per the Krazan & Associates Geotechnical Report (Project No. 012-25193) and seismic parameters per the 2022 CBC.

PART 2 - PRODUCTS

2.1 WATER STORAGE TANK

- A. Basis of Design: Norwesco 5,000-gallon vertical polyethylene above-ground water storage tank, or approved equal. Tank shall be manufactured from FDA-compliant, NSF/ANSI 61 certified polyethylene resin suitable for potable water storage.
- B. Tank Dimensions (nominal):
 - 1. Nominal Capacity: 5,000 gallons.
 - 2. Outer Diameter: As shown on Improvement Plans.
 - 3. Overall Height: As shown on Improvement Plans.
 - 4. Manway/Lid Opening: $\pm$ 24 inches diameter.
- C. Tank Fittings: Fittings shall be polypropylene, NSF/ANSI 61 certified, and shall include the following as shown on the Improvement Plans:
 - 1. 1-1/2-inch FPT inlet fitting (standard tank fitting).
 - 2. 2-inch FPT outlet fitting (standard tank fitting).
 - 3. 3-inch FPT polypropylene fitting, installed in dome for additional venting.
- D. Venting: Provide one (1) 3-inch screened vent, installed on dome fitting. Screen shall prevent entry of insects, debris, and rodents while allowing pressure equalization. Screened vent shall be NSF/ANSI 61 compatible.

2.2 SEISMIC ANCHORAGE

- A. Seismic Anchor Kit: Furnish and install a manufacturer-supplied seismic anchor kit compatible with the 5,000-gallon tank. Anchor kit shall include anchor straps, hardware, and all components required for a complete installation.
- B. Anchorage design, including anchor strap sizing, embedment, and concrete foundation reinforcement, shall be designed by a licensed Structural Engineer as specified under Article 1.3 Submittals. Installation shall be per the stamped structural engineering package and manufacturer's written instructions.

2.3 WATER CIRCULATION MIXER

- A. Basis of Design: Ixom Watercare GridBee GS-9 electric submersible water circulation mixer, or approved equal. Mixer shall be NSF/ANSI/CAN 61-G and 372 certified for potable water contact.
- B. Mixer shall be designed for continuous submerged operation and shall be installable and retrievable through the tank manway without requiring tank entry, using the manufacturer-supplied T316 stainless steel retrieval chain.
- C. Motor: 1/2 HP, 120VAC/1PH, 60Hz submersible motor with automatic reset thermal overload

protection and surge arresters. Requires 20-Amp GFCI electrical service. Electrical connection and controls integration, including float switch low-level interlock with the booster pump station, shall be as specified in Section 33 12 23 – Water Utility Pumping Stations.

- D. Sealed Penetration Fitting: T316 stainless steel tank fitting and cord grip, included with mixer, for sealed cord entry through tank dome. Install per manufacturer's written instructions.
- E. Minimum Water Depth: Mixer shall not operate when water surface is less than 2 feet above the mixer discharge slots. Low-level float switch shall disable mixer and booster pump at this level as specified in Section 33 12 23 – Water Utility Pumping Stations.

2.4 TANK-MOUNTED FLOAT SWITCH

- A. Provide one (1) tank-mounted float switch for low-level detection. Float switch shall be suitable for potable water service and NSF/ANSI 61 compatible. Float switch shall be installed at the elevation shown on the Improvement Plans and shall disable the water circulation mixer and booster pump station upon detection of low water level, as specified in Section 33 12 23 – Water Utility Pumping Stations.
- B. Float switch materials, wiring, and installation shall be per manufacturer's written instructions. Wiring shall be routed to the junction box at the top of the tank.

2.5 CONCRETE FOUNDATION PAD

- A. The Contractor shall furnish and construct a concrete foundation pad for support of the water storage tank. Foundation pad dimensions, thickness, reinforcement, and anchor bolt layout shall be as shown on the stamped structural engineering drawings submitted per Article 1.3.
- B. Foundation design shall be consistent with the geotechnical recommendations of Krazan & Associates, Inc. (Project No. 012-25193), including allowable bearing pressure, subgrade preparation, and compaction requirements. Concrete shall be a minimum 2,500 psi compressive strength at 28 days unless a higher strength is required by the structural engineer.
- C. Subgrade preparation beneath the foundation pad shall comply with the Geotechnical Report recommendations and Section 33 05 00 – Common Work Results for Utilities.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade conditions at the tank pad location are acceptable prior to construction. Notify the Engineer of Record of any soft, unstable, or unsuitable subgrade conditions encountered.
- B. Do not proceed with foundation pad construction until the stamped structural engineering package has been submitted to and approved by the Engineer of Record.

3.2 INSTALLATION

- A. Foundation Pad: Construct concrete foundation pad in accordance with the stamped structural engineering drawings and the Geotechnical Report recommendations. Subgrade shall be proof-rolled and observed prior to placing concrete. Do not place concrete on frozen, saturated, or unstable subgrade.
- B. Tank Installation: Install tank on cured foundation pad per manufacturer's written instructions and as shown on the Improvement Plans. Do not install tank until foundation pad has achieved sufficient strength as determined by the Structural Engineer.
- C. Seismic Anchorage: Install seismic anchor kit per the stamped structural engineering drawings and manufacturer's written instructions. Anchor straps shall be installed tight and secure without damaging the tank wall. Submit field photos of completed anchorage installation to the Engineer of Record.
- D. Fittings and Venting: Install all tank fittings and screened vent per manufacturer's written instructions. Ensure all fittings are watertight. Install screened vent in dome fitting at completion of tank installation. Install water circulation mixer and float switch per manufacturer's written instructions and as shown on the Improvement Plans.
- E. Piping Connections: Connect tank outlet fitting to the distribution piping system as shown on the Improvement Plans and per Section 33 11 16 – Site Water Utility Distribution Piping. Provide a hinged, lockable manway cover as shown on the Improvement Plans.

3.3 FIELD QUALITY CONTROL

- A. Inspect completed tank installation for plumb and level. Tank shall be installed level within manufacturer's tolerances.
- B. Fill tank with potable water and inspect all fittings and connections for leaks. Repair any leaks before placing system in service.
- C. The Contractor shall cooperate with the Engineer of Record and Soils Engineer, and shall provide access to all work areas for inspection and testing.

END OF SECTION

SECTION 333100

SANITARY UTILITY SEWERAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing and installing gravity sanitary sewer collection piping, fittings, and cleanouts from the modular restroom to the septic tank, as part of the Onsite Wastewater Treatment System (OWTS), as shown on the Improvement Plans.
- B. Related Sections:
 - 1. Section 33 05 00 – Common Work Results for Utilities.
 - 2. Section 33 36 13 – Utility Septic Tank and Effluent Wet Wells.
 - 3. Section 33 36 16.16 – Utility Septic Tank Effluent Pump Package.
 - 4. Section 33 36 33 – Utility Septic Tank Drainage Field.

1.2 REFERENCES

- A. The following standards and references apply to this Section:
 - 1. Merced County Environmental Health Department – OWTS Permit and applicable standards. In the event of conflict between these specifications and the Merced County EH permit conditions, the more stringent requirement shall govern.
 - 2. City of Los Banos Improvement Standards, latest edition – Division 5, Section 510 (Pipelines, General) and Section 512 (Sanitary Sewer Pipelines).
 - 3. ASTM D3034 – Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 4. ASTM F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 - 5. Geotechnical Engineering Investigation, Krazan & Associates, Inc., Project No. 012-25193, dated October 14, 2025.

1.3 SUBMITTALS

- A. Submit the following to the Engineer of Record for review and approval prior to installation:
 - 1. Product data for pipe, fittings, and cleanouts including manufacturer's specifications and installation instructions.
 - 2. The Merced County Environmental Health Department OWTS permit will be provided to the Contractor as part of the Contract Documents. All OWTS work shall be performed in strict accordance with the permit conditions.
 - 3. Pipe and pipe joint product data per City Standards Section 510-1, prior to purchase.

PART 2 - PRODUCTS

2.1 GRAVITY SEWER PIPE

- A. Gravity Sewer Pipe: Polyvinyl Chloride (PVC) sewer pipe, SDR 35, conforming to ASTM D3034. Pipe shall be clearly marked with the applicable ASTM standard and SDR designation.
- B. Pipe size shall be as shown on the Improvement Plans.

2.2 FITTINGS

- A. Fittings: PVC sewer fittings conforming to ASTM D3034 or ASTM D2665, compatible with SDR 35 pipe. Fittings shall include wyes, elbows, couplings, and reducers as shown on the Improvement Plans and as required for a complete installation.

2.3 JOINTS

- A. Joints: Per pipe and fitting manufacturer's written instructions. Elastomeric gaskets, where used, shall conform to ASTM F477. Joint preparation, lubrication, and assembly shall be per manufacturer's written instructions.

2.4 CLEANOUTS

- A. Cleanouts: Type, size, and location as shown on the Improvement Plans. Cleanout covers shall be set flush with finished grade and shall be accessible for maintenance without excavation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that trench grades, alignments, and subgrade conditions are acceptable prior to installation. Notify the Engineer of Record of conditions that differ materially from those shown on the Improvement Plans.
- B. Do not commence OWTS construction until the Merced County Environmental Health Department OWTS permit has been provided to the Contractor as part of the Contract Documents and all permit conditions have been reviewed.

3.2 INSTALLATION

- A. General: Install all gravity sewer piping, fittings, and cleanouts in accordance with the Improvement Plans, Merced County EH permit conditions, City Standards Division 5 Sections 510 and 512, and manufacturer's written instructions. Excavation, bedding, backfill, and compaction shall conform to Section 33 05 00 – Common Work Results for Utilities.

- B. Pipe Slope: Gravity sewer piping shall be installed at a minimum slope of 2 percent (1/4 inch per foot) unless a steeper slope is required by the Merced County EH permit or as shown on the Improvement Plans.
- C. Grade and Alignment: Establish and verify alignment and grade for trench bottom prior to excavation. Trenches shall be true to line and grade per City Standards Section 510-2.2. Obtain approval of the Engineer of Record before laying pipe.
- D. Pipe Laying: Lay and joint all pipe per manufacturer's written instructions and City Standards Section 510-2.5. Pipe shall be laid on a shaped trench bottom to provide uniform support. Keep pipe interior free of debris. Close all open pipe ends with a suitable plug when pipe laying is not in progress.
- E. Cleanouts: Install cleanouts at locations shown on the Improvement Plans and per manufacturer's written instructions. Set cleanout covers flush with finished grade. Cleanouts shall be accessible for maintenance.
- F. Groundwater and Trench Safety: Sandy cohesionless soils have been encountered at the site and have a tendency to cave in trench wall excavations. Shoring or sloping of trench sidewalls may be required. Refer to Section 33 05 00 – Common Work Results for Utilities for dewatering and trench safety requirements. Note that groundwater was encountered at approximately 7 feet below existing grade per the Geotechnical Report. Dewatering may be required for deeper excavations.

3.3 FIELD QUALITY CONTROL

- A. Testing: Test completed gravity sewer piping per City Standards Section 512-4 and Merced County EH permit requirements. All testing shall be performed after backfilling is complete. Repair any failed sections and retest until acceptable.
- B. Inspection: The Merced County Environmental Health Department shall inspect the OWTS installation prior to backfilling, as required by the permit. Contractor shall provide advance notice to the County EH inspector and the Engineer of Record before covering any OWTS work.
- C. The Contractor shall cooperate with the Engineer of Record, Soils Engineer, and Merced County EH inspector, and shall provide access to all work areas for inspection and testing.

END OF SECTION

SECTION 333613

UTILITY SEPTIC TANK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing and installing one (1) precast concrete septic tank, including inlet and outlet plumbing assemblies, access risers and lids, effluent filter, anti-flotation anchoring, and all appurtenances required for a complete and functioning installation, as part of the Onsite Wastewater Treatment System (OWTS), as shown on the Improvement Plans.
- B. Related Sections:
 - 1. Section 33 05 00 – Common Work Results for Utilities.
 - 2. Section 33 31 00 – Sanitary Utility Sewerage Piping.
 - 3. Section 33 36 16.16 – Utility Septic Tank Effluent Pump Package.
 - 4. Section 33 36 33 – Utility Septic Tank Drainage Field.

1.2 REFERENCES

- A. The following standards and references apply to this Section:
 - 1. Merced County Environmental Health Department – OWTS Permit and applicable standards. The Merced County EH OWTS permit will be provided to the Contractor as part of the Contract Documents. All OWTS work shall be performed in strict accordance with the permit conditions. In the event of conflict between these specifications and the permit conditions, the more stringent requirement shall govern.
 - 2. ASTM C1227 – Standard Specification for Precast Concrete Septic Tanks.
 - 3. ASTM C890 – Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
 - 4. ACI 318 – Building Code Requirements for Structural Concrete.
 - 5. IAPMO/ANSI Z1000 – Prefabricated Septic Tanks.
 - 6. Geotechnical Engineering Investigation, Krazan & Associates, Inc., Project No. 012-25193, dated October 14, 2025.

1.3 SUBMITTALS

- A. Submit the following to the Engineer of Record for review and approval prior to installation:
 - 1. Product data for septic tank including manufacturer's specifications, dimensions, structural design calculations or certifications, IAPMO listing, and installation instructions.
 - 2. Product data for effluent filter including manufacturer's specifications and installation instructions.

3. Product data for access risers and lids.
4. Structural Engineering Package: Design and calculations for the anti-flotation anchoring system (concrete collar or ballast slab with tie-down straps), prepared, signed, and stamped by a licensed Structural Engineer. Package shall be submitted to and approved by the Engineer of Record prior to installation. Package shall address site-specific groundwater and buoyant uplift conditions per the Krazan & Associates Geotechnical Report (Project No. 012-25193).

PART 2 - PRODUCTS

2.1 SEPTIC TANK

- A. Precast Concrete Septic Tank: Furnish and install a precast concrete septic tank complying with ASTM C1227 and listed by IAPMO R&T to Standard Z1000. Tank shall be designed and rated for AASHTO H-20 traffic loading. Tank shall comply with all Merced County Environmental Health Department OWTS permit requirements.
- B. Capacity: 1,500 gallons nominal. Tank has been sized based on a design flow of 845 GPD per Merced County Code Section 9.54.080.L.2.a (design flow x 1.5 = tank size), as confirmed by the Merced County EH OWTS permit.
- C. Tank Dimensions (nominal):
 1. Length: As shown on Improvement Plans.
 2. Width: As shown on Improvement Plans.
 3. Height (exterior): As shown on Improvement Plans.
 4. Inlet Invert: As shown on Improvement Plans.
 5. Outlet Invert: As shown on Improvement Plans.
- D. Structural Design: Tank shall be designed per ASTM C890, ACI 318, and AASHTO H-20 traffic loading. Tank and all access risers and lids shall be rated for vehicle traffic. Tank shall be covered with a minimum of 12 inches of soil per Merced County Code Section 9.54.080.L.13. Minimum horizontal distance from the septic tank to any building foundation shall be 5 feet per Merced County Code Section 9.54.080.L.11. Tank shall be secured against flotation as specified in Article 2.2 - Anti-Flotation Anchoring.
- E. Compartments: Minimum two (2) compartments as required by Merced County Code Section 9.54.080.L.3. The inlet compartment shall not be less than two-thirds of the total tank capacity per Section 9.54.080.L.5. Inlet and outlet baffles shall extend a minimum of 4 inches above and 12 inches below the water surface per Section 9.54.080.L.4.
- F. Plumbing Assemblies: 4-inch inlet and outlet plumbing assemblies, compatible with SDR 35 PVC collection piping specified in Section 33 31 00.

2.2 ANTI-FLOTATION ANCHORING

- A. Furnish and install anti-flotation anchoring (concrete collar or ballast slab with tie-down straps) compatible with the septic tank, sized to resist hydrostatic uplift under high groundwater

conditions, including empty or partially empty tank conditions.

- B. Anchoring design, including collar/ballast slab dimensions, strap sizing, and reinforcement, shall be designed by a licensed Structural Engineer as specified under Article 1.3 Submittals. Installation shall be per the stamped structural engineering package and manufacturer's written instructions.

2.3 ACCESS RISERS AND LIDS

- A. Provide access risers and lids at each compartment access opening, as shown on the Improvement Plans. Minimum two (2) access openings required, one over each compartment, per Merced County Code Section 9.54.080.L.6. Risers and lids shall be rated for AASHTO H-20 traffic loading. Riser height shall accommodate finished grade, with riser top set flush with or up to 36 inches above the tank top slab. Where the tank is installed greater than 2 feet below ground surface, risers shall extend to or above grade with a bolted or locked watertight lid per Merced County Code Section 9.54.080.L.7. The tank-riser interface shall be watertight.
- B. Access riser diameter: 24 inches minimum. Risers and lids shall be compatible with the tank manufacturer's system. Lids shall be securely fastened and provide a water-resistant seal to prevent infiltration.

2.4 EFFLUENT FILTER

- A. Provide an effluent filter at the septic tank outlet, installed in the outlet plumbing assembly. Effluent filter shall be NSF/ANSI certified with a maximum passage of 3/16 inch, as required by Merced County Code Section 9.54.080.L.8. Effluent filter shall comply with all Merced County Environmental Health Department OWTS permit requirements and applicable standards.
- B. Effluent filter shall be compatible with the 4-inch outlet plumbing assembly and shall be accessible for inspection and maintenance through the outlet access riser without requiring tank entry.
- C. Materials, flow capacity, and filtration rating shall be per manufacturer's recommendations and Merced County EH permit requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that excavation dimensions, subgrade conditions, and invert elevations are acceptable prior to tank installation. Notify the Engineer of Record of any conditions that differ materially from those shown on the Improvement Plans.
- B. Note that groundwater was encountered at approximately 7 feet below existing grade per the Geotechnical Engineering Investigation by Krazan & Associates, Inc. (Project No. 012-25193). Dewatering may be required during excavation and installation. Refer to Section 33 05 00 –

Common Work Results for Utilities.

- C. Do not proceed with anti-flotation anchoring installation until the stamped structural engineering package has been submitted to and approved by the Engineer of Record.
- D. Permit Posting: The Merced County EH OWTS permit shall be posted in a readily accessible location on the property prior to commencement of any OWTS work and shall remain posted during all phases of inspection and until final approval is documented, per Merced County Code Section 9.54.060.A.2. Contractor shall provide a minimum 24-hour advance notice to the Merced County Division of Environmental Health prior to commencement of work and prior to each required inspection.

3.2 INSTALLATION

- A. General: Install septic tank in accordance with the tank manufacturer's written installation procedure, Merced County EH permit conditions, and as shown on the Improvement Plans. Excavation, bedding, backfill, and compaction shall conform to Section 33 05 00 – Common Work Results for Utilities.
- B. Bedding: Provide a uniform, level, and stable bedding base for the tank per manufacturer's written instructions and Merced County EH permit requirements.
- C. Tank Placement: Set tank at invert elevations shown on the Improvement Plans. Verify inlet invert is higher than outlet invert to ensure gravity flow through the tank. Do not place tank on frozen, saturated, or unstable subgrade.
- D. Anti-Flotation Anchoring: Install anchoring system per the stamped structural engineering drawings and manufacturer's written instructions prior to backfilling. Submit field photos of completed anchoring installation to the Engineer of Record.
- E. Plumbing Connections: Connect inlet plumbing assembly to the gravity sewer collection piping per Section 33 31 00 – Sanitary Utility Sewerage Piping. Connect outlet plumbing assembly to the effluent pump station per Section 33 36 16.16 – Utility Septic Tank Effluent Pump Package. All connections shall be watertight.
- F. Effluent Filter: Install effluent filter in the outlet plumbing assembly per manufacturer's written instructions and Merced County EH permit requirements prior to backfilling.
- G. Access Risers and Lids: Install access risers and lids per manufacturer's written instructions. Set riser tops at the elevation shown on the Improvement Plans. Lids shall be secured and sealed.
- H. Backfill: Do not backfill until the Merced County EH inspector and Engineer of Record have inspected the installation. Backfill and compact per Section 33 05 00 – Common Work Results for Utilities and manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Testing: Perform water or vacuum testing of the completed tank installation per manufacturer's installation procedure and Merced County EH permit requirements prior to backfilling.

Document and submit test results to the Engineer of Record.

- B. Inspection: The Merced County Environmental Health Department shall inspect the septic tank installation prior to backfilling, as required by the permit. Contractor shall provide advance notice to the County EH inspector and the Engineer of Record before covering any OWTS work.
- C. The Contractor shall cooperate with the Engineer of Record, Soils Engineer, and Merced County EH inspector, and shall provide access to all work areas for inspection and testing.

END OF SECTION

SECTION 333616.16

UTILITY SEPTIC TANK EFFLUENT PUMP PACKAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing and installing one (1) packaged effluent pump station, including wet well, anti-flotation anchoring, submersible effluent pump, float level switches, high water alarm, simplex control panel, internal piping and valving, access cover, and all appurtenances required for a complete and functioning installation. Also includes the PVC force main from the pump station to the leach field. All work shall be performed as part of the Onsite Wastewater Treatment System (OWTS) in accordance with the Merced County Environmental Health Department OWTS permit and as shown on the Improvement Plans.
- B. Related Sections:
 - 1. Section 33 05 00 – Common Work Results for Utilities.
 - 2. Section 33 31 00 – Sanitary Utility Sewerage Piping.
 - 3. Section 33 36 13 – Utility Septic Tank and Effluent Wet Wells.
 - 4. Section 33 36 33 – Utility Septic Tank Drainage Field.

1.2 REFERENCES

- A. The following standards and references apply to this Section:
 - 1. Merced County Environmental Health Department – OWTS Permit and applicable standards. The Merced County EH OWTS permit will be provided to the Contractor as part of the Contract Documents. All OWTS work shall be performed in strict accordance with the permit conditions. In the event of conflict between these specifications and the permit conditions, the more stringent requirement shall govern.
 - 2. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
 - 3. ASTM D3753 - Standard Specification for Glass-Fiber-Reinforced Polyester Manholes.
 - 4. ASTM D1784 – Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
 - 5. ASTM D2774 – Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
 - 6. NFPA 70 – National Electrical Code (NEC).
 - 7. 2022 California Electrical Code (CEC).
 - 8. Geotechnical Engineering Investigation, Krazan & Associates, Inc., Project No. 012-25193, dated October 14, 2025.

1.3 SUBMITTALS

- A. Submit the following to the Engineer of Record for review and approval prior to installation:

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1. Product data for the packaged pump station including manufacturer's specifications, pump performance curves, wet well material specifications, control panel data, float switch data, and installation instructions.
2. Product data for force main pipe, fittings, and valves.
3. Wiring diagram showing electrical connections, float switch wiring, and alarm circuit.
4. Operation and Maintenance (O&M) manual for pump station.
5. Structural Engineering Package: Design and calculations for the anti-flotation anchoring system (concrete collar or ballast slab with tie-down straps), prepared, signed, and stamped by a licensed Structural Engineer. Package shall be submitted to and approved by the Engineer of Record prior to installation. Package shall address site-specific groundwater and buoyant uplift conditions per the Krazan & Associates Geotechnical Report (Project No. 012-25193).

PART 2 - PRODUCTS

2.1 PACKAGED EFFLUENT PUMP STATION

- A. General: Furnish and install a factory pre-assembled simplex effluent pump station package including wet well, submersible effluent pump, internal piping and valving, float switches, simplex control panel with high water alarm, and access cover. System shall be designed to receive clarified effluent from the septic tank and pump to the leach field via the force main. Package shall comply with Merced County EH OWTS permit requirements.

2.2 WET WELL

- A. Wet well shall be either reinforced precast concrete or fiberglass, at Contractor's option, subject to review and approval by the Engineer of Record. Concrete wet wells shall conform to ASTM C478. Fiberglass wet wells shall conform to ASTM D3753. Regardless of material, the wet well shall be watertight, corrosion-resistant to septic effluent, and structurally adequate for the burial conditions at the site per the Geotechnical Engineering Investigation by Krazan & Associates, Inc. (Project No. 012-25193, dated October 14, 2025). Wet well shall be secured against flotation as specified in Article 2.3 – Anti-Flotation Anchoring.
- B. Wet well dimensions shall be as recommended by the manufacturer for the specified pump and float switch configuration. Contractor shall not be required to conform to specific dimensional requirements, provided the system meets the performance requirements of this Section and the Merced County EH OWTS permit.

- C. Access Cover: Provide a sanitary sewer manhole lid per City of Los Banos Improvement Standards and Specifications

2.3 ANTI-FLOTATION ANCHORING

- A. Furnish and install anti-flotation anchoring (concrete collar or ballast slab with tie-down straps) compatible with the wet well, sized to resist hydrostatic uplift under high groundwater conditions, including empty or partially empty wet well conditions.

- B. Anchoring design, including collar/ballast slab dimensions, strap sizing, and reinforcement, shall be designed by a licensed Structural Engineer as specified under Article 1.3 Submittals. Installation shall be per the stamped structural engineering package and manufacturer's written instructions.

2.4 SUBMERSIBLE EFFLUENT PUMP

- A. Basis of Design: Zoeller Model BN151 submersible effluent pump, or approved equal.
- B. Performance Requirements:
 - 1. Minimum Flow: 15 GPM.
 - 2. Minimum Total Dynamic Head (TDH): 15 feet.
 - 3. Motor: 1/3 HP minimum, 115VAC/1PH, 60Hz.
 - 4. Discharge: 1-1/4-inch NPT minimum.
 - 5. Motor Protection: Automatic reset thermal overload.
- C. Construction: Pump shall be suitable for continuous submerged operation handling clarified septic effluent. Wetted materials shall be compatible with septic effluent service. Hardware shall be stainless steel.
- D. Pump shall be equipped with a self-engaging lift-out assembly and a minimum 20-foot UL-listed power cord for connection to the control panel.
- E. Pump shall be tested to UL Standard UL778 and certified to CSA Standard CSA22.2 No. 108, or approved equal certifications.

2.5 FLOAT SWITCHES

- A. Provide a minimum of three (3) mechanical float control switches as part of the packaged unit, set to the following elevations as shown on the Improvement Plans:
 - 1. Pump Off: Low water level – pump deactivated.
 - 2. Pump On: Lead pump activation level.
 - 3. High Water Alarm: Activates alarm in control panel when effluent level exceeds normal operating range.
- B. Float switches shall be mounted on a stainless steel float bracket within the wet well. Float switch cords shall be routed to the control panel.

2.6 SIMPLEX CONTROL PANEL

- A. Provide a simplex pump control panel as part of the packaged unit. Panel shall be float switch operated and shall include as a minimum:
 - 1. NEMA 4X enclosure with lockable hasp.
 - 2. High water alarm beacon (visual) and alarm buzzer (audible).
 - 3. Test and silence switches.

4. Hand-Off-Auto (HOA) switch.
 5. Pump run indicator light.
 6. Float switch status indicators.
- B. Control panel mounting, design, hardware, and conduit shall be by the Contractor and per manufacturer's recommendations. Electrical work shall be performed by a licensed electrical contractor in accordance with NFPA 70 and the 2022 California Electrical Code.

2.7 INTERNAL PIPING AND VALVING

- A. All internal piping, fittings, and valves within the wet well shall be PVC conforming to ASTM D1784. Pipe and fittings shall be Schedule 40 minimum. All hardware within the wet well shall be 316 stainless steel.
- B. Provide a ball valve on the pump discharge piping within the wet well for pump isolation, sized to match the pump discharge connection. Ball valve shall be true union type, Schedule 80 PVC.

2.8 FORCE MAIN

- A. Force Main Pipe: 1-1/4-inch Schedule 40 PVC pressure pipe, conforming to ASTM D1785. Pipe shall be clearly marked with the applicable ASTM standard and schedule designation.
- B. Fittings: Schedule 40 PVC fittings conforming to ASTM D2466, compatible with 1-1/4-inch Schedule 40 pipe. Fittings shall include elbows, couplings, and adapters as shown on the Improvement Plans.
- C. Joints: Solvent weld per manufacturer's written instructions using solvent cement conforming to ASTM D2564. Allow adequate cure time before pressurizing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that excavation dimensions, subgrade conditions, and invert elevations are acceptable prior to pump station installation. Notify the Engineer of Record of any conditions that differ materially from those shown on the Improvement Plans.
- B. Note that groundwater was encountered at approximately 7 feet below existing grade per the Geotechnical Engineering Investigation by Krazan & Associates, Inc. (Project No. 012-25193). Dewatering may be required during excavation and installation. Refer to Section 33 05 00 – Common Work Results for Utilities.
- C. Do not proceed with anti-flotation anchoring installation until the stamped structural engineering package has been submitted to and approved by the Engineer of Record.
- D. Permit Posting: The Merced County EH OWTS permit shall be posted in a readily accessible location on the property prior to commencement of any OWTS work and shall remain posted

during all phases of inspection and until final approval is documented, per Merced County Code Section 9.54.060.A.2. Contractor shall provide a minimum 24-hour advance notice to the Merced County Division of Environmental Health prior to commencement of work and prior to each required inspection.

3.2 INSTALLATION

- A. General: Install packaged pump station in accordance with manufacturer's written installation instructions, Merced County EH permit conditions, and as shown on the Improvement Plans. Excavation, bedding, backfill, and compaction shall conform to Section 33 05 00 – Common Work Results for Utilities.
- B. Anti-Flotation Anchoring: Install anchoring system per the stamped structural engineering drawings and manufacturer's written instructions prior to backfilling. Submit field photos of completed anchoring installation to the Engineer of Record.
- C. Inlet Connection: Connect inlet pipe from the septic tank outlet to the pump station wet well at the invert elevation shown on the Improvement Plans. Inlet piping shall conform to Section 33 31 00 – Sanitary Utility Sewerage Piping.
- D. Force Main Connection: Connect force main to the pump station discharge at the elevation shown on the Improvement Plans. Install force main to the leach field in accordance with Section 33 36 33 – Utility Septic Tank Drainage Field and as shown on the Improvement Plans. Excavation, bedding, backfill, and compaction for the force main trench shall conform to Section 33 05 00 – Common Work Results for Utilities.
- E. Electrical: Provide electrical service to the control panel in accordance with NFPA 70 and the 2022 California Electrical Code. Electrical work shall be performed by a licensed electrical contractor. Control panel mounting and conduit installation shall be per manufacturer's recommendations.
- F. Backfill: Do not backfill until the Merced County EH inspector and Engineer of Record have inspected the installation. Backfill and compact per Section 33 05 00 – Common Work Results for Utilities and manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Startup and Testing: Prior to placing the system in service, perform startup and operational testing of the pump station per manufacturer's written instructions. Verify the following:
 - 1. Pump operates at design flow and head.
 - 2. Float switches cycle pump on and off at correct levels.
 - 3. High water alarm activates at correct level.
 - 4. HOA switch functions correctly.
 - 5. No leaks at wet well, pump connections, or force main.
 - 6. Force main pressure tested per ASTM D2774 and Merced County EH permit requirements.
- B. Submit a written startup and test report to the Engineer of Record upon completion.

- C. Inspection: The Merced County Environmental Health Department shall inspect the pump station installation prior to backfilling, as required by the permit. Contractor shall provide advance notice to the County EH inspector and the Engineer of Record before covering any OWTS work.
- D. The Contractor shall cooperate with the Engineer of Record, Soils Engineer, and Merced County EH inspector, and shall provide access to all work areas for inspection and testing.

END OF SECTION

SECTION 333633

UTILITY SEPTIC TANK DRAINAGE FIELD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing and installing a mounded subsurface leach field consisting of perforated pipe, drain rock, geotextile fabric, and earthen cover mound, distribution box, and all associated appurtenances, as part of the Onsite Wastewater Treatment System (OWTS). The mounded system is required to achieve the minimum 5-foot separation between the bottom of the leach field and the highest anticipated groundwater level. Elevations, mound geometry, and layout shall be as shown on the Improvement Plans and per Merced County EH OWTS permit.
- B. Related Sections:
 - 1. Section 33 05 00 – Common Work Results for Utilities.
 - 2. Section 33 36 13 – Utility Septic Tank and Effluent Wet Wells.
 - 3. Section 33 36 16.16 – Utility Septic Tank Effluent Pump Package.

1.2 REFERENCES

- A. The following standards and references govern the design, materials, and installation of the leach field:
 - 1. Merced County Environmental Health Department – OWTS Permit and Merced County Code Chapter 9.54, including Section 9.54.080.M (Leachfield Specifications). The Merced County EH OWTS permit will be provided to the Contractor as part of the Contract Documents. All leach field work shall be performed in strict accordance with the permit conditions and approved Improvement Plans. In the event of conflict between these specifications and the permit conditions, the more stringent requirement shall govern.
 - 2. Geotechnical Engineering Investigation, Krazan & Associates, Inc., Project No. 012-25193, dated October 14, 2025.

1.3 SUBMITTALS

- A. Submit the following to the Engineer of Record prior to installation:
 - 1. Product data for perforated leach pipe, drain rock gradation, distribution box, and geotextile fabric.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials shall comply with the requirements of Merced County Code Section 9.54.080.M and the Merced County EH OWTS permit. The following minimum material requirements apply:
- B. Leach Pipe: Perforated PVC pipe, minimum 4 inches in diameter, with perforations of one-quarter to one-half inch diameter, per Merced County Code Section 9.54.080.M.10.
- C. Drain Rock: Round washed gravel, minimum 3/4 inch and maximum 2-1/2 inch nominal diameter, free of fines, sand, silt, and clay. Crushed rock is not acceptable per Merced County Code Section 9.54.080.M.3.
- D. Geotextile Fabric: Untreated building paper or fine mesh geotextile fabric suitable to cover drain rock and prevent backfill materials from entering voids, per Merced County Code Section 9.54.080.M.11.
- E. Distribution Box: Watertight precast concrete with integral bottom, designed and positioned to assure equalized flow to all leach lines. All inlets and outlets shall be sealed per Merced County Code Section 9.54.080.M.5. Minimum inside dimension shall be 12 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that leach field location, trench alignments, depths, and subgrade conditions conform to the approved Improvement Plans and Merced County EH OWTS permit prior to commencing installation. Notify the Engineer of Record of any differing site conditions.
- B. Do not install leach field in saturated soils per Merced County Code Section 9.54.080.M.6. Groundwater was encountered at approximately 7 feet below existing grade per the Geotechnical Engineering Investigation by Krazan & Associates, Inc. (Project No. 012-25193). A mounded leach field system is required to achieve the minimum 5-foot separation between the bottom of the leach field and the highest anticipated groundwater level per Merced County Code Section 9.54.080.H.1. Mound elevations and geometry shall be as shown on the Improvement Plans and as approved by the Merced County EH OWTS permit.
- C. Permit Posting: The Merced County EH OWTS permit shall be posted in a readily accessible location on the property prior to commencement of any OWTS work and shall remain posted during all phases of inspection and until final approval is documented, per Merced County Code Section 9.54.060.A.2. Contractor shall provide a minimum 24-hour advance notice to the Merced County Division of Environmental Health prior to commencement of work and prior to each required inspection.

3.2 INSTALLATION

- A. General: Install mounded leach field in strict accordance with the Merced County EH OWTS permit conditions, Merced County Code Section 9.54.080.M, and the Improvement Plans. The mounded system shall be constructed above existing grade to achieve the required groundwater separation. Mound elevations, geometry, fill material specifications, and leach field layout shall be as shown on the Improvement Plans and as approved by the Merced County EH OWTS permit. Excavation, bedding, backfill, and compaction shall conform to Section 33 05 00 - Common Work Results for Utilities. Where conflict exists between these specifications and the permit, the permit shall govern.
- B. Mound Construction and Leach Field Dimensions: Mound geometry, leach field bed dimensions, leach line layout, and cover soil depths shall be as shown on the Improvement Plans and as required by the Merced County EH OWTS permit and applicable standards.
- C. Drain Rock Placement: Place drain rock in the leach bed as shown on the Improvement Plans and per Merced County EH OWTS permit requirements. At a minimum, provide 18 inches of drain rock below the leach pipe and 4 inches of drain rock cover over the leach pipe per Merced County Code Section 9.54.080.M.11.
- D. Pipe Installation: Lay perforated leach pipe level in the leach bed at the elevation shown on the Improvement Plans. Maximum leach line length shall be 100 feet per Merced County Code Section 9.54.080.M.2. Minimum center-to-center spacing between leach lines shall be 10 feet per Merced County Code Section 9.54.080.M.8.
- E. Geotextile Fabric and Cover: Cover drain rock with geotextile fabric prior to placing cover soil. Minimum earthen cover over fabric shall be 1 foot per Merced County Code Section 9.54.080.M.11. Mound cover soil depth, slopes, and finished grades shall be as shown on the Improvement Plans and per Merced County EH OWTS permit requirements. Mound side slopes shall be graded to prevent erosion and promote surface drainage away from the leach field.
- F. Distribution Box: Install distribution box at the head of the leach field per Merced County Code Section 9.54.080.M.12 and as shown on the Improvement Plans. Connect each leach line individually to the distribution box.
- G. Setbacks: Maintain all minimum horizontal separation distances per Merced County Code Section 9.54.080.K and as shown on the Improvement Plans.
- H. Backfill: Do not backfill until the Merced County EH inspector and Engineer of Record have inspected and approved the installation. Backfill and compact per Section 33 05 00 – Common Work Results for Utilities.

3.3 FIELD QUALITY CONTROL

- A. Inspection: The Merced County Environmental Health Department shall inspect the leach field installation prior to backfilling, as required by the OWTS permit. Contractor shall provide a minimum 24-hour advance notice to the County EH inspector and the Engineer of Record before covering any OWTS work.
- B. The Contractor shall cooperate with the Engineer of Record, Soils Engineer, and Merced

County EH inspector, and shall provide access to all work areas for inspection.

END OF SECTION

APPENDIX

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**GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED MODULAR RESTROOM
HENRY MILLER ROAD
LOS BANOS, CALIFORNIA**

**PROJECT NO. 012-25193
OCTOBER 14, 2025**

Prepared for:

**MR. TYLER FAY
WESTWOOD COMPANY
1165 SCENIC DRIVE
MODESTO, CALIFORNIA 95350**

Prepared by:

**KRAZAN & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING DIVISION
215 W. DAKOTA AVENUE
CLOVIS, CALIFORNIA 93612
(559) 348-2200**



GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

October 14, 2025

Project No. 012-25193

Mr. Tyler Fay
Westwood Company
1165 Scenic Drive
Modesto, California 95350

RE: Geotechnical Engineering Investigation
Proposed Modular Restroom
Henry Miller Road
Los Banos, California

Dear Mr. Fay:

In accordance with your request, we have completed a Geotechnical Engineering Investigation for the above-referenced site. The results of our investigation are presented in the attached report.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (559) 348-2200.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.



David R. Jarosz, II
Managing Engineer
RGE No. 2698/RCE No. 60185

DRJ:ht

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October 14, 2025

Project No. 012-25193

**GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED MODULAR RESTROOM
HENRY MILLER ROAD
LOS BANOS, CALIFORNIA**

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed modular restroom project to be located approximately 1.6 miles east of Mercey Springs Road/Highway 165, on the south side of Henry Miller Road in Los Banos, California. Discussions regarding site conditions are presented herein, together with conclusions and recommendations pertaining to site preparation, Engineered Fill, utility trench backfill, drainage and landscaping, foundations, concrete floor slabs and exterior flatwork, retaining walls, and soil cement reactivity.

A site plan showing the approximate boring location is presented following the text of this report. A description of the field investigation, boring log, and the boring log legend are presented in Appendix A. Appendix A also contains a description of the laboratory testing phase of this study, along with the laboratory test results. Appendix B contains a guide to earthwork specifications. When conflicts in the text of the report occur with the general specifications in the appendices, the recommendations in the text of the report have precedence.

PURPOSE AND SCOPE

This investigation was conducted to evaluate the soil and groundwater conditions at the site, to make geotechnical engineering recommendations for use in design of specific construction elements, and to provide criteria for site preparation and Engineered Fill construction.

Our scope of services was outlined in our proposal dated June 21, 2025 (KA Proposal No. P412-25) and included the following:

- A site reconnaissance by a member of our engineering staff to evaluate the surface conditions at the project site.
- A field investigation consisting of drilling 1 boring to a depth of approximately 35 feet for evaluation of the subsurface conditions at the project sites.
- Performing laboratory tests on representative soil samples obtained from the boring to evaluate the physical and index properties of the subsurface soils.

- Evaluation of the data obtained from the investigation and an engineering analysis to provide recommendations for use in the project design and preparation of construction specifications.
- Preparation of this report summarizing the results, conclusions, recommendations, and findings of our investigation.

PROPOSED CONSTRUCTION

We understand that design of the proposed restroom structure is currently underway; structural load information and other final details pertaining to the structure are unavailable. On a preliminary basis, it is understood the proposed development will include the installation of a modular restroom building on the west side of the existing City of Los Banos Police Department gun range. It is anticipated the restroom will be a single-story structure that will include concrete underground storage tanks for potable water and a vaulted septic tank. It is our understanding that there will be no leach lines and that the waste generated will be pumped out as needed. Foundation loads are anticipated to be light to moderate.

In the event these structural or grading details are inconsistent with the final design criteria, the Soils Engineer should be notified so that we may update this writing as applicable.

SITE LOCATION AND SITE DESCRIPTION

The project site is located on the western side of the City of Los Banos Police Department gun range facility in Los Banos, California. A gravel covered parking lot, access road, wetlands, and Henry Miller Road are located to the north; a metal shade structure and a shooting range consisting of recycled asphalt grindings and a dirt berm located to the east; and wetlands and vacant fields are located to the south and west.

Presently, the proposed project area is located approximately 60 feet northwest of an existing open-air shade structure. The project area surface is covered with approximately 4 to 8 inches of recycled asphaltic concrete grindings. An overhead electric line is coming in from the south and supplies power to the shade structure. The surface soils have a loose consistency. Buried utility lines may be located within site and vicinity. The site is relatively level with no major change in grade.

GEOLOGIC SETTING

The San Joaquin Valley, which includes the Los Banos area, is a topographic and structural basin that is bounded on the east by the Sierra Nevada Mountains and on the west by the Coast Ranges. The Sierra Nevada, a fault block dipping gently southwestward, is made up of igneous and metamorphic rocks of pre-tertiary age that comprise the basement complex beneath the Valley. The Coast Ranges contain folded and faulted sedimentary rocks of Mesozoic and Cenozoic age, which are similar to those rocks that underlie the Valley at depth and nonconformably overlie the basement complex. Gently dipping to nearly horizontal sedimentary rocks of Tertiary and Quaternary age overlies the older rocks. These younger rocks are mostly of continental origin and in the Los Banos area; they were derived from the Sierra Nevada Mountains or Coast Ranges.

The San Joaquin River is the principal river in the area. Alluvial fans and marsh deposits, formed by this river, are the largest geomorphic features in the Los Banos area. The formation of the fans and marsh lands has resulted in rather flat regional topography.

The Coast Ranges evolved as a result of folding, faulting, and accretion of diverse geologic terrains. They are composed chiefly of sedimentary and metamorphic rocks that are sharply deformed into complex structures. They are broken by numerous faults, the San Andreas Fault being the most notable structural feature.

Both the Sierra Nevada and Coast Range are geologically young mountain ranges and possess active and potentially active fault zones. Major active faults and fault zones occur at some distance to the west and south of the Los Banos area. The Owens Valley Fault Zone bounds the eastern edge of the Sierra Nevada block and contains both active and potentially active faults.

Portions of the Great Valley, Ortigalita, Calaveras, San Andreas, and Hayward faults, which are to the west, are considered active. The San Andreas Fault is possibly the best-known fault and is located about 40 miles to the southwest.

There are no active fault traces in the project vicinity. Accordingly, the project area is not within an Earthquake Fault Zone (Special Studies Zone) and will not require a special site investigation by an Engineering Geologist.

Los Banos residents could feel the effects of a large seismic event on one of the nearby active or potentially active fault zones. Los Banos has experienced groundshaking from earthquakes in the historical past. According to the Five County Seismic Safety Element, groundshaking of VII intensity (Modified Mercalli Scale) was felt in Los Banos from the 1872 Owens Valley Earthquake. This is one of the largest known earthquake events to have affected the Los Banos area.

Secondary hazards from earthquakes include rupture, seiche, landslides, liquefaction, and subsidence. Since there are no known faults within the immediate area, ground rupture from surface faulting should not be a potential problem. Seiche and landslides are not hazards in the area either. Liquefaction potential (sudden loss of shear strength in a saturated cohesionless soil) is a potential concern due to the shallow groundwater in the area. Lastly, deep subsidence problems may be low to moderate according to the conclusions of the Five County Seismic Safety Element. However, there are no known occurrences of structural or architectural damage due to deep subsidence in the Los Banos area.

FIELD AND LABORATORY INVESTIGATION

Subsurface soil conditions were explored by drilling 1 boring to a depth of approximately 35 feet below existing site grade, using a truck-mounted drill rig. The approximate boring location is shown on the site plan. During drilling operations, penetration tests were performed at regular intervals to evaluate the soil consistency and to obtain information regarding the engineering properties of the subsoils. Soil samples were retained for laboratory testing. The soils encountered were continuously examined and visually classified in accordance with the Unified Soil Classification System. A more detailed description of the field investigation is presented in Appendix A.

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory testing program was formulated with emphasis on the evaluation of natural moisture, density, gradation, shear strength, consolidation potential, expansion potential, and moisture-density relationships of the materials encountered. In addition, chemical tests were performed to evaluate the soil-cement reactivity. Details of the laboratory test program and results of the laboratory tests are summarized in Appendix A. This information, along with the field observations, was used to prepare the final boring log in Appendix A.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Based on our findings, the subsurface conditions encountered appear typical of those found in the geologic region of the site. In general, the surface soils are covered with approximately 4 to 8 inches of recycled asphalt concrete grindings. Below the recycled asphalt grindings surface, approximately 6 to 12 inches of very loose sandy clay was encountered. These soils are disturbed, have low strength characteristics, and are highly compressible when saturated.

Below the recycled asphaltic concrete grindings and loose surface soils, approximately 2 to 3 feet of firm sandy clay or loose clayey sand/sandy clay were encountered. Field and laboratory tests suggest that these soils are moderately strong, slightly compressible, and have a moderate potential for expansion. Penetration resistance was 9 blows per foot. A representative soil sample had a dry density of 93 pcf. A representative soil sample consolidated approximately 2½ percent under a 2 ksf load when saturated. A representative soil sample had an expansion index of 84.

Below 4 feet, layers of predominately loose to medium dense silty sand, silty sand/sandy silt, silty sand/sand, and sand or very stiff sandy clay were encountered. Field and laboratory tests suggest that these soils are moderately strong and slightly compressible. Penetration resistance ranged from 9 to 21 blows per foot. Dry densities ranged from 88 to 110 pcf. A representative soil sample had an internal angle of friction of 31 degrees. These soils have similar strength characteristics as the upper soils and extended to termination depth of our boring.

For additional information about the soils encountered, please refer to the boring log in Appendix A.

GROUNDWATER

The test boring location was checked for the presence of groundwater during and immediately following the drilling operations. Free groundwater was encountered at a depth of 7 feet during our exploratory drilling.

It should be recognized that water table elevations may fluctuate with time, being dependent upon seasonal precipitation, irrigation, land use, and climatic conditions, as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of our field and laboratory investigations, along with previous geotechnical experience in the project area, the following is a summary of our evaluations, conclusions, and recommendations.

Administrative Summary

In brief, the subject site and soil conditions, with the exception of the loose surface soils, moderately expansive nature of the on-site clayey soils, shallow groundwater, and existing development, appear to be conducive to the development of the project. The surface soils have a loose consistency. These soils are disturbed, have low strength characteristics and are highly compressible when saturated. Accordingly, it is recommended that the surface soils be recompacted. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

Fill material was not encountered in our boring. However, fill may be present beyond our boring location. The extent of fill material was determined based on a limited test boring and visual observation. Verification of the extent of fill should be determined during site grading. It is recommended that fill soils which have not been properly compacted and certified be excavated and stockpiled so that the native soils can be prepared properly. It is anticipated the fill material will be suitable for reuse as general Engineered Fill, provided it is cleansed of excessive organics and debris. However, supplemental testing will be required during construction to determine its suitability for re-use as non-expansive Engineered Fill.

A shade structure, shooting range, and an overhead electric line is located within the project site area. Associated with these developments are buried structures, such as utility lines that may extend into the area of planned construction. Demolition activities should have included proper removal of any buried structures. Any buried structures, including loosely backfilled excavations or utilities, encountered during construction should be properly removed and/or relocated. It is suspected demolition activities will disturb the upper soils. Following demolition activities, the exposed subgrade should be cleaned to firm native ground. The resulting excavation should be backfilled with Engineered Fill, compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

The upper on-site soils are predominately sandy clay and clayey sand/sandy clay. These clayey soils exhibit a moderate shrink/swell potential and are subject to volumetric changes if moisture contents vary. The estimated swell pressure of the clayey soil may cause movement, affecting slabs and brittle exterior finishes. To reduce the potential soil movement, it is recommended that the upper 24 inches of soil supporting slabs-on-grade and lightly loaded shallow foundations (less than 800 psf) consist of non-expansive fill. The fill material should be a well-graded silty sand or sandy silt soil meeting the requirements provided in the Engineered Fill section of this report for non-expansive fill. A clean sand or very sandy soil is not acceptable for this purpose. A sandy soil will allow the surface water to drain into the expansive clayey soils below, which may result in swelling. The replacement soil and/or the upper 24 inches of Imported Fill soils should meet the specifications as described under the subheading

Engineered Fill. The replacement soils should extend 5 feet beyond the perimeter of the structures. The non-expansive replacement soil should be compacted to at least 90 percent relative compaction based on ASTM Test Method D1557. The exposed native soils in the excavation should not be allowed to dry out and should be kept continuously moist prior to backfilling. In addition, it is recommended that footings and slabs be nominally reinforced to reduce cracking and vertical off-set.

Sandy soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy soils.

After completion of the recommended site preparation, the site should be suitable for shallow footing support. The proposed structure footings may be designed utilizing an allowable bearing pressure of 2,000 psf for dead-plus-live loads. Footings should have a minimum embedment of 12 inches. Recommendations regarding conventional foundations are provided in the Foundation section of this report.

Groundwater Influence on Structures/Construction

During our recent field investigation groundwater was encountered at approximately 7 feet below existing site grade. Therefore, dewatering and/or waterproofing may be required should structures or excavations extend below this depth. If groundwater is encountered, our firm should be consulted prior to dewatering the site. Installation of a standpipe piezometer is suggested prior to construction should groundwater levels be a concern.

In addition to the groundwater level, if earthwork is performed during or soon after periods of precipitation, the subgrade soils may become saturated, "pump," or not respond to densification techniques. Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material; or mixing the soil with an approved lime or cement product. Our firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

Site Preparation

General site clearing should include removal of vegetation; debris; existing utilities; structures including foundations; basement walls and floors; existing stockpiled soil; trees and associated root systems; rubble; rubbish; and any loose and/or saturated materials. Site stripping should extend to a minimum depth of 2 to 4 inches, or until all organics in excess of 3 percent by volume are removed. Deeper stripping may be required in localized areas. These materials will not be suitable for use as Engineered Fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas.

Fill material was not encountered in our boring. However, fill may be present beyond our boring location. The extent of fill material was determined based on a limited test boring and visual observation. Verification of the extent of fill should be determined during site grading. It is recommended that fill soils which have not been properly compacted and certified be excavated and

stockpiled so that the native soils can be prepared properly. It is anticipated the fill material will be suitable for reuse as general Engineered Fill, provided it is cleansed of excessive organics and debris. However, supplemental testing will be required during construction to determine its suitability for re-use as non-expansive Engineered Fill.

A shade structure, shooting range, and an overhead electric line is located within the project site area. Associated with these developments are buried structures, such as utility lines that may extend into the area planned for construction. Demolition activities should include proper removal of any buried structures. Any buried structures, including loosely backfilled excavations or utilities, encountered during construction should be properly removed and/or relocated. The resulting excavations should be cleaned to firm native ground and backfilled with Engineered Fill, compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. It is suspected demolition activities will disturb the upper soils. Disturbed areas caused by demolition activities should be recompacted. Excavations, depressions, or soft and pliant areas extending below planned finish subgrade level should be cleaned to firm undisturbed soil, and backfilled with Engineered Fill. In general, any septic tanks, debris pits, cesspools, or similar structures should be entirely removed. Concrete footings should be removed to an equivalent depth of at least 3 feet below proposed footing elevations or as recommended by the Soils Engineer. Any other buried structures should be removed in accordance with the recommendations of the Soils Engineer. The resulting excavations should be backfilled with Engineered Fill.

Following stripping, fill removal, and demolition activities, it is recommended that at a minimum, the upper 24 inches of exposed subgrade soils beneath the building pad area be excavated, worked until uniform and free from large clods, moisture-conditioned to a minimum of 2 percent above optimum moisture content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Limits of recompaction should extend a minimum of 5 feet beyond structural elements. Prior to backfilling, the bottom of the excavation should be proof-rolled and observed by Krazan & Associates, Inc. to verify stability. Soft or pliant areas should be excavated to firm native ground. This compaction effort should stabilize the upper soils and locate any unsuitable or pliant areas not found during our field investigation.

It is recommended that the upper 24 inches of soil within proposed conventional slab-on-grade and exterior flatwork areas consist of non-expansive Engineered Fill or lime-treated Engineered Fill. The fill placement serves two functions: 1) it provides a uniform amount of soil which will more evenly distribute the soil pressures and 2) it reduces moisture content fluctuation in the clayey material beneath the building area. The non-expansive fill material should be a well-graded silty sand or sandy silt soil. A clean sand or very sandy soil is not acceptable for this purpose. A sandy soil will allow the surface water to drain into the expansive clayey soil below, which may result in soil swelling. Imported Fill should be approved by the Soils Engineer prior to placement. The fill should be placed as specified as Engineered Fill. In addition, it is recommended footings and concrete slabs-on-grade be nominally reinforced.

Sandy soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy soils.

The upper soils, during wet winter months, become very moist due to the absorptive characteristics of the soil. Earthwork operations performed during winter months may encounter very moist unstable soils, which may require removal to grade a stable building foundation. Project site winterization consisting of placement of aggregate base and protecting exposed soils during the construction phase should be performed.

A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material. The Soils Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section and the Engineered Fill section.

Engineered Fill

The on-site, upper native soils predominately consisted of sandy clay, clayey sand/sandy clay, and silty sand/sandy silt. The clayey soils will not be suitable for reuse as non-expansive Engineered Fill. The clayey soils will be suitable for reuse for fill placement within the upper 24 inches of conventional slab-on-grade and exterior flatwork areas, provided they are lime-treated. The preliminary application rate of lime should be 5 percent by dry weight. The lime material should be calcium oxide, commonly known as quick-lime. The clayey soils should be above optimum moisture-condition during mixing operations. Additional testing is recommended to determine the appropriate application rate of lime prior to placement. These clayey soils will be suitable for reuse as General Engineered Fill, within pavement areas and below 24 inches from finished pad grade in building areas, provided they are cleansed of excessive organics, debris, fragments larger than 4 inches in diameter, and moisture-conditioned to at least 2 percent above optimum moisture. It is recommended that additional testing be performed on the on-site soils and fill material to evaluate the physical and index properties prior to reuse as Engineered Fill.

The preferred materials specified for Engineered Fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor, since he has complete control of the project site at that time.

Imported Fill material should be predominately non-expansive granular material with a plasticity index less than 10 and an expansion index less than 15. Imported Fill should be free from rocks and lumps greater than 4 inches in diameter. All Imported Fill material should be submitted for approval to the Soils Engineer at least 48 hours prior to delivery to the site.

Percent Passing No. 200 Sieve	20 to 50
Plasticity Index	10 maximum
UBC Standard 29-2 Expansion Index	15 maximum

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned as necessary, and compacted to achieve at least 90 percent maximum density based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

Drainage and Landscaping

The ground surface should slope away from building pad and pavement areas toward appropriate drop inlets or other surface drainage devices. In accordance with Section 1804 of the 2022 California Building Code, it is recommended that the ground surface adjacent to foundations be sloped a minimum of 5 percent for a minimum distance of 10 feet away from structures, or to an approved alternative means of drainage conveyance. Swales used for conveyance of drainage and located within 10 feet of foundations should be sloped a minimum of 2 percent. Impervious surfaces, such as pavement and exterior concrete flatwork, within 10 feet of building foundations should be sloped a minimum of 1 percent away from the structure. Drainage gradients should be maintained to carry all surface water to collection facilities and off-site. These grades should be maintained for the life of the project.

Slots or weep holes should be placed in drop inlets or other surface drainage devices in pavement areas to allow free drainage of adjoining base course materials. Cutoff walls should be installed at pavement edges adjacent to vehicular traffic areas; these walls should extend to a minimum depth of 12 inches below pavement subgrades to limit the amount of seepage water that can infiltrate the pavements. Where cutoff walls are undesirable, subgrade drains can be constructed to transport excess water away from planters to drainage interceptors. If cutoff walls can be successfully used at the site, construction of subgrade drains is considered unnecessary.

Utility Trench Backfill

Utility trenches should be excavated according to accepted engineering practices following OSHA (Occupational Safety and Health Administration) standards by a Contractor experienced in such work. The responsibility for the safety of open trenches should be borne by the Contractor. Traffic and vibration adjacent to trench walls should be minimized; cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

Sandy soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy soils.

Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 90 percent of maximum density based on ASTM Test Method D1557. The utility trench backfill placed in pavement areas should be compacted to at least 90 percent of maximum density based on ASTM Test Method D1557. Pipe bedding should be in accordance with pipe manufacturer's recommendations.

The Contractor is responsible for removing all water-sensitive soils from the trench regardless of the backfill location and compaction requirements. The Contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

Foundations - Conventional

After completion of the recommended site preparation, the site should be suitable for shallow footing support. The proposed structures may be supported on a shallow foundation system bearing on undisturbed native soils or Engineered Fill. Spread and continuous footings can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	1,500 psf
Dead-Plus-Live Load	2,000 psf
Total Load, Including Wind or Seismic Loads	2,650 psf

The footings should have a minimum depth of 12 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Footings should have a minimum width of 12 inches, regardless of load. Ultimate design of foundations and reinforcement should be performed by the project Structural Engineer.

The footing excavations should not be allowed to dry out any time prior to pouring concrete. It is recommended that footings be reinforced by at least one No. 4 reinforcing bar in both top and bottom.

The total movement is not expected to exceed 1 inch. Differential movement should be less than ½ inch. Most of the settlement is expected to occur during construction, as the loads are applied. However, additional post-construction movement may occur if the foundation soils are flooded or saturated.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.3 acting between the base of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 250 pounds per cubic foot acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A ⅓ increase in the value above may be used for short duration, wind, or seismic loads.

Floor Slabs and Exterior Flatwork

In areas where moisture-sensitive floor coverings will be included, concrete slab-on-grade floors should be underlain by a water vapor retarder. The water vapor retarder should be installed in accordance with accepted engineering practice. The water vapor retarder should consist of a vapor retarder sheeting underlain by a minimum of 3 inches of compacted, clean, gravel of $\frac{3}{4}$ -inch maximum size. To aid in concrete curing an optional 2 to 4 inches of granular fill may be placed on top of the vapor retarder. The granular fill should consist of damp clean sand with at least 10 to 30 percent of the sand passing the 100 sieve. The sand should be free of clay, silt, or organic material. Rock dust which is manufactured sand from rock crushing operations is typically suitable for the granular fill. This granular fill material should be compacted.

The floor slab should be reinforced at a minimum with #3 reinforcement bars at 18 inches on-center each way within the middle one-third. Thicker floor slabs with increased concrete strength and reinforcement should be designed wherever heavy concentrated loads, heavy equipment, or machinery is anticipated.

The exterior floors should be poured separately in order to act independently of the walls and foundation system. All fills required to bring the building pads to grade should be Engineered Fills.

Moisture within the structure may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor can travel through the vapor membrane and penetrate the slab-on-grade. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structure. To reduce moisture vapor intrusion, it is recommended that a vapor retarder be installed. It is recommended that the utility trenches within the structure be compacted, as specified in our report, to reduce the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the building is recommended. Positive drainage should be established away from the structure and should be maintained throughout the life of the structure. Ponding of water should not be allowed adjacent to the structure. Over-irrigation within landscaped areas adjacent to the structure should not be performed. In addition, ventilation of the structure (i.e. ventilation fans) is recommended to reduce the accumulation of interior moisture.

Lateral Earth Pressures and Retaining Walls

Walls retaining horizontal backfill and capable of deflecting a minimum of 0.1 percent of its height at the top may be designed using an equivalent fluid active pressure of 50 pounds per square foot per foot of depth. Walls that are incapable of this deflection or walls that are fully constrained against deflection may be designed for an equivalent fluid at-rest pressure of 70 pounds per square foot per foot per depth. Expansive soils should not be used for backfill against walls. The wedge of non-expansive backfill material should extend from the bottom of each retaining wall outward and upward at a slope of 2:1 (horizontal to vertical) or flatter. The stated lateral earth pressures do not include the effects of hydrostatic water pressures generated by infiltrating surface water that may accumulate behind the retaining walls; or loads imposed by construction equipment, foundations, or roadways.

Retaining and/or below grade walls should be drained with either perforated pipe encased in free-draining gravel or a prefabricated drainage system. The gravel zone should have a minimum width of 12 inches and should extend upward to within 12 inches of the top of the wall. The upper 12 inches of backfill should consist of native soils, concrete, asphaltic concrete, or other suitable backfill to reduce surface drainage into the wall drain system. The aggregate should conform to Class 2 permeable materials graded in accordance with CalTrans Standard Specifications (2024). Prefabricated drainage systems, such as Miradrain®, Enkadrain®, or an equivalent substitute, are acceptable alternatives in lieu of gravel, provided they are installed in accordance with the manufacturer's recommendations. If a prefabricated drainage system is proposed, our firm should review the system for final acceptance prior to installation.

Drainage pipes should be placed with perforations down and should discharge in a non-erosive manner away from foundations and other improvements. The pipes should be placed no higher than 6 inches above the heel of the wall, in the center line of the drainage blanket and should have a minimum diameter of four inches. Collector pipes may be either slotted or perforated. Slots should be no wider than 1/8 inch in diameter, while perforations should be no more than 1/4 inch in diameter. If retaining walls are less than 6 feet in height, the perforated pipe may be omitted in lieu of weep holes on 4 feet maximum spacing. The weep holes should consist of 4-inch diameter holes (concrete walls) or unmortared head joints (masonry walls) and not be higher than 18 inches above the lowest adjacent grade. Two 8-inch square overlapping patches of geotextile fabric (conforming to CalTrans Standard Specifications for "edge drains") should be affixed to the rear wall opening of each weep hole to retard soil piping.

During grading and backfilling operations adjacent to any walls, heavy equipment should not be allowed to operate within a lateral distance of 5 feet from the wall or within a lateral distance equal to the wall height, whichever is greater, to avoid developing excessive lateral pressures. Within this zone, only hand operated equipment ("whackers," vibratory plates, or pneumatic compactors) should be used to compact the backfill soils.

Seismic Parameters – 2022 California Building Code

The Site Class per Section 1613 of the 2022 California Building Code (2022 CBC) and ASCE 7-16, Chapter 20 is based upon the site soil conditions. It is our opinion that a Site Class D is most consistent with the subject site soil conditions. For seismic design of the structures based on the seismic provisions of the 2022 CBC, we recommend the following parameters:

Seismic Item	Value	CBC Reference
Site Class	D	Section 1613.2.2
Site Coefficient F_a	1.082	Table 1613.2.3 (1)
S_s	1.045	Section 1613.2.1
S_{MS}	1.130	Section 1613.2.3
S_{DS}	0.754	Section 1613.2.4
Site Coefficient F_v	1.934	Table 1613.2.3 (2)

S ₁	0.366	Section 1613.2.1
S _{M1}	0.708	Section 1613.2.3
S _{D1}	0.472	Section 1613.2.4
T _s	0.626	Section 1613.2

* Based on Equivalent Lateral Force (ELF) Design Procedure being used

Soil Cement Reactivity

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete (or stucco) and the soil. HUD/FHA and CBC have developed criteria for evaluation of sulfate levels and how they relate to cement reactivity with soil and/or water.

Soil samples were obtained from the site and tested in accordance with State of California Materials Manual Test Designation 417. The sulfate concentration detected from a soil sample was greater than 150 ppm (1,590 ppm) and is above the maximum allowable values established by HUD/FHA and CBC. Therefore, it is recommended that a Type II/V cement be used within the concrete to compensate for sulfate reactivity with the cement. Representative soil samples had a chloride concentration of 1,000 ppm and a pH 8.3.

Compacted Material Acceptance

Compaction specifications are not the only criteria for acceptance of the site grading or other such activities. However, the compaction test is the most universally recognized test method for assessing the performance of the Grading Contractor. The numerical test results from the compaction test cannot be used to predict the engineering performance of the compacted material. Therefore, the acceptance of compacted materials will also be dependent on the stability of that material. The Soils Engineer has the option of rejecting any compacted material regardless of the degree of compaction if that material is considered to be unstable or if future instability is suspected. A specific example of rejection of fill material passing the required percent compaction is a fill which has been compacted with an in-situ moisture content significantly less than optimum moisture. This type of dry fill (brittle fill) is susceptible to future settlement if it becomes saturated or flooded.

Testing and Inspection

A representative of Krazan & Associates, Inc. should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. Krazan & Associates, Inc. will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor.

LIMITATIONS

Soils Engineering is one of the newest divisions of Civil Engineering. This branch of Civil Engineering is constantly improving as new technologies and understanding of earth sciences advance. Although your site was analyzed using the most appropriate and most current techniques and methods, undoubtedly there will be substantial future improvements in this branch of engineering. In addition to advancements in the field of Soils Engineering, physical changes in the site, either due to excavation or fill placement, new agency regulations, or possible changes in the proposed structure after the soils report is completed may require the soils report to be professionally reviewed. In light of this, the Owner should be aware that there is a practical limit to the usefulness of this report without critical review. Although the time limit for this review is strictly arbitrary, it is suggested that 2 years be considered a reasonable time for the usefulness of this report.

Foundation and earthwork construction is characterized by the presence of a calculated risk that soil and groundwater conditions have been fully revealed by the original foundation investigation. This risk is derived from the practical necessity of basing interpretations and design conclusions on limited sampling of the earth. The recommendations made in this report are based on the assumption that soil conditions do not vary significantly from those disclosed during our field investigation. If any variations or undesirable conditions are encountered during construction, the Soils Engineer should be notified so that supplemental recommendations may be made.

The conclusions of this report are based on the information provided regarding the proposed construction. If the proposed construction is relocated or redesigned, the conclusions in this report may not be valid. The Soils Engineer should be notified of any changes so the recommendations may be reviewed and re-evaluated.

This report is a Geotechnical Engineering Investigation with the purpose of evaluating the soil conditions in terms of foundation design. The scope of our services did not include any Environmental Site Assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater, or atmosphere; or the presence of wetlands. Any statements, or absence of statements, in this report or on any boring log regarding odors, unusual or suspicious items, or conditions observed, are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessment.

The geotechnical engineering information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical engineering developments. We emphasize that this report is valid for the project outlined above and should not be used for any other sites.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (559) 348-2200.



Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

A handwritten signature in blue ink, appearing to read "Wayne Andrade".

Wayne Andrade
Project Geologist

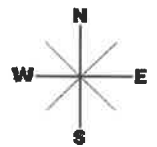
A handwritten signature in blue ink, appearing to read "David R. Jarosz, II".

David R. Jarosz, II
Managing Engineer
RGE No. 2698/RCE No. 60185

WA/DRJ:ht



● APPROXIMATE BORING LOCATION



SITE MAP	Scale: NTS	Date: October 2025	
Proposed Modular Restroom Henry Miller Road Los Banos, California	Drawn by: WA	Approved by: DJ	
	Project No. 012-25193	Figure No. 1	

APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. One 6½-inch exploratory boring was advanced. The boring location is shown on the site plan.

The soils encountered were logged in the field during the exploration and, with supplementary laboratory test data, are described in accordance with the Unified Soil Classification System.

Modified standard penetration tests were performed at selected depths. These tests represent the resistance to driving a 2½-inch diameter core barrel sampler. The driving energy was provided by a hammer weighing 140 pounds, falling 30 inches. Relatively undisturbed soil samples were obtained while performing this test. Bag samples of the disturbed soil were obtained from the auger cuttings. All samples were returned to our Clovis laboratory for evaluation.

Laboratory Investigation

The laboratory investigation was programmed to determine the physical and mechanical properties of the foundation soil underlying the site. Test results were used as criteria for determining the engineering suitability of the surface and subsurface materials encountered.

In-situ moisture content, dry density, consolidation, direct shear, and sieve analysis tests were completed for the undisturbed samples representative of the subsurface material. Expansion index tests were completed for select bag samples obtained from the auger cuttings. These tests, supplemented by visual observation, comprised the basis for our evaluation of the site material.

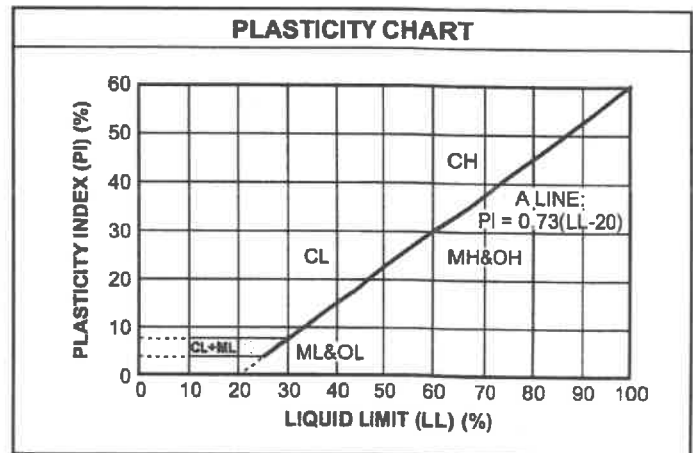
The log of the exploratory boring and laboratory determinations are presented in this Appendix.

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART			
COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)		
		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)		
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)		
		SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)		
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

CONSISTENCY CLASSIFICATION	
Description	Blows per Foot
<i>Granular Soils</i>	
Very Loose	< 5
Loose	5 – 15
Medium Dense	16 – 40
Dense	41 – 65
Very Dense	> 65
<i>Cohesive Soils</i>	
Very Soft	< 3
Soft	3 – 5
Firm	6 – 10
Stiff	11 – 20
Very Stiff	21 – 40
Hard	> 40

GRAIN SIZE CLASSIFICATION		
Grain Type	Standard Sieve Size	Grain Size in Millimeters
Boulders	Above 12 inches	Above 305
Cobbles	3 to 12 inches	305 to 76.2
Gravel	3 inches to No. 4	76.2 to 4.76
Coarse-grained	3 to ¾ inches	76.2 to 19.1
Fine-grained	¾ inches to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.074
Coarse-grained	No. 4 to No. 10	4.76 to 2.00
Medium-grained	No. 10 to No. 40	2.00 to 0.42
Fine-grained	No. 40 to No. 200	0.42 to 0.074
Silt and Clay	Below No. 200	Below 0.074



Log of Boring B1

Project: Modular Restroom

Project No: 012-25193

Client: Westwood Professional Services, Inc.

Figure No.: A-1

Location: Henry Miller Road, Los Banos, California

Logged By: Emmett Gonzales

Depth to Water>

Initial: 8 Feet

At Completion: 7 Feet

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.							
0		Ground Surface											
		ASPHALT GRINDINGS = 4 inches											
		SANDY CLAY (CL) Firm, fine-grained; dark brown, moist, drills easily											
2		CLAYEY SAND/SANDY CLAY (SC/CL) Loose, fine-grained; light brown, moist, drills easily	93.2	26.2		9							
4		SILTY SAND/SANDY SILT (SM/ML) Loose, fine- to medium-grained; brown, moist, drills easily											
		SILTY SAND/SANDY SILT (SM/ML) Loose, fine- to medium-grained; brown, moist, drills easily	88.0	24.1		11							
6													
		SILTY SAND (SM) Loose, fine-grained, brown, saturated, drills easily											
8													
10		SAND (SP) Medium dense, fine- to medium-grained; gray, saturated, drills easily	89.3	40.5		18							
12													
14													
16			109.5	11.2		21							
18													
20		Loose below 20 feet											

Drill Method: Hollow Stem

Drill Date: 9-9-25

Drill Rig: CME 45C

Krazan and Associates

Hole Size: 6½ Inches

Driller: Eddie Tapia

Elevation: 35 Feet

Sheet: 1 of 2

Log of Boring B1

Project: Modular Restroom

Client: Westwood Professional Services, Inc.

Location: Henry Miller Road, Los Banos, California

Depth to Water>

Initial: 8 Feet

Project No: 012-25193

Figure No.: A-1

Logged By: Emmett Gonzales

At Completion: 7 Feet

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.		
22			106.6	15.1		9		
24		SANDY CLAY (CL) Very stiff, fine-grained; brown, saturated, drills easily						
26			105.5	23.2		21		
28		SILTY SAND/SAND (SM/SP) Medium dense, fine-grained; gray, saturated, drills easily						
30			110.3	21.4		18		
32								
34								
36		End of Borehole						
38								
40								

Drill Method: Hollow Stem

Drill Rig: CME 45C

Driller: Eddie Tapia

Krazan and Associates

Drill Date: 9-9-25

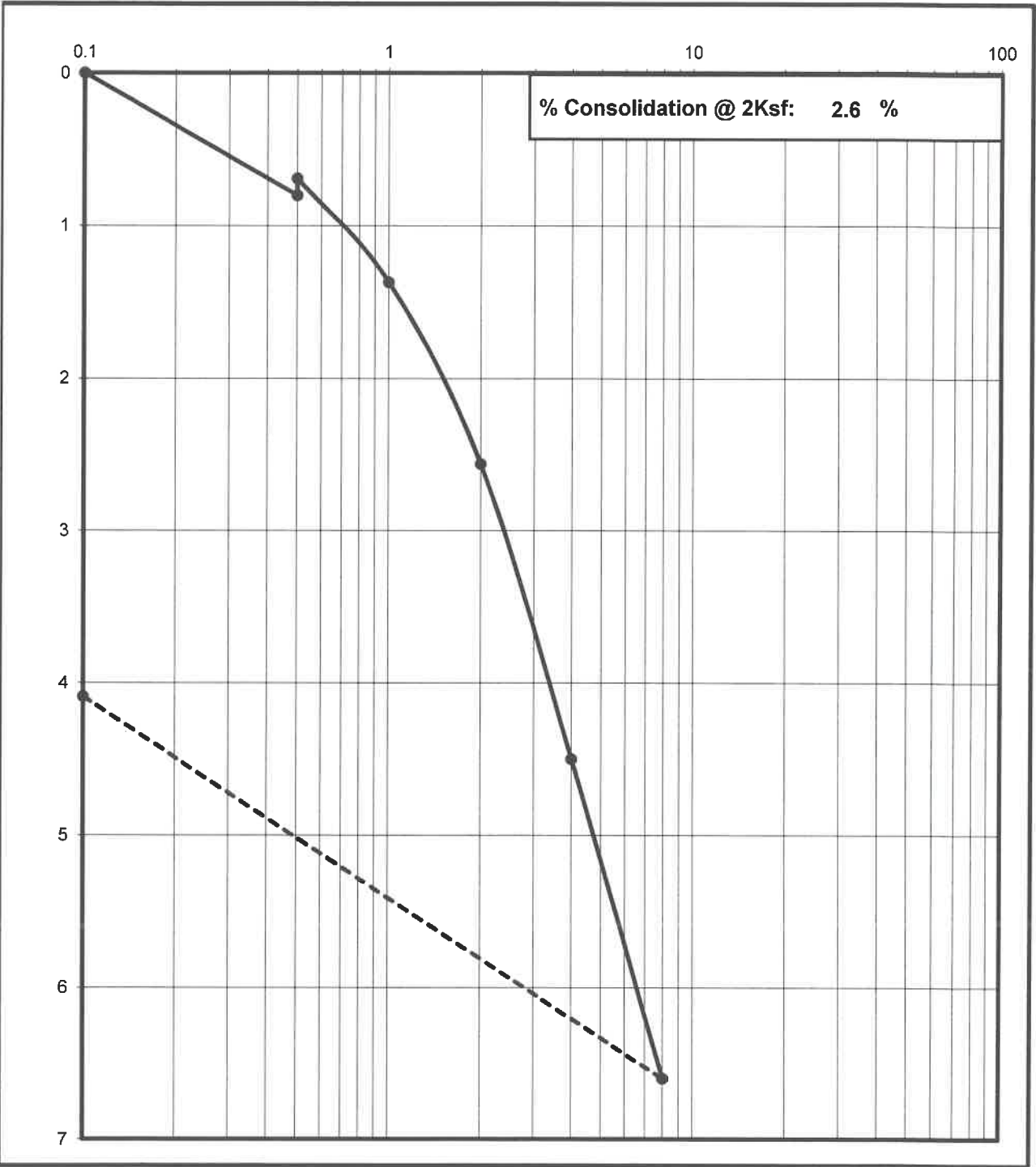
Hole Size: 6½ Inches

Elevation: 35 Feet

Sheet: 2 of 2

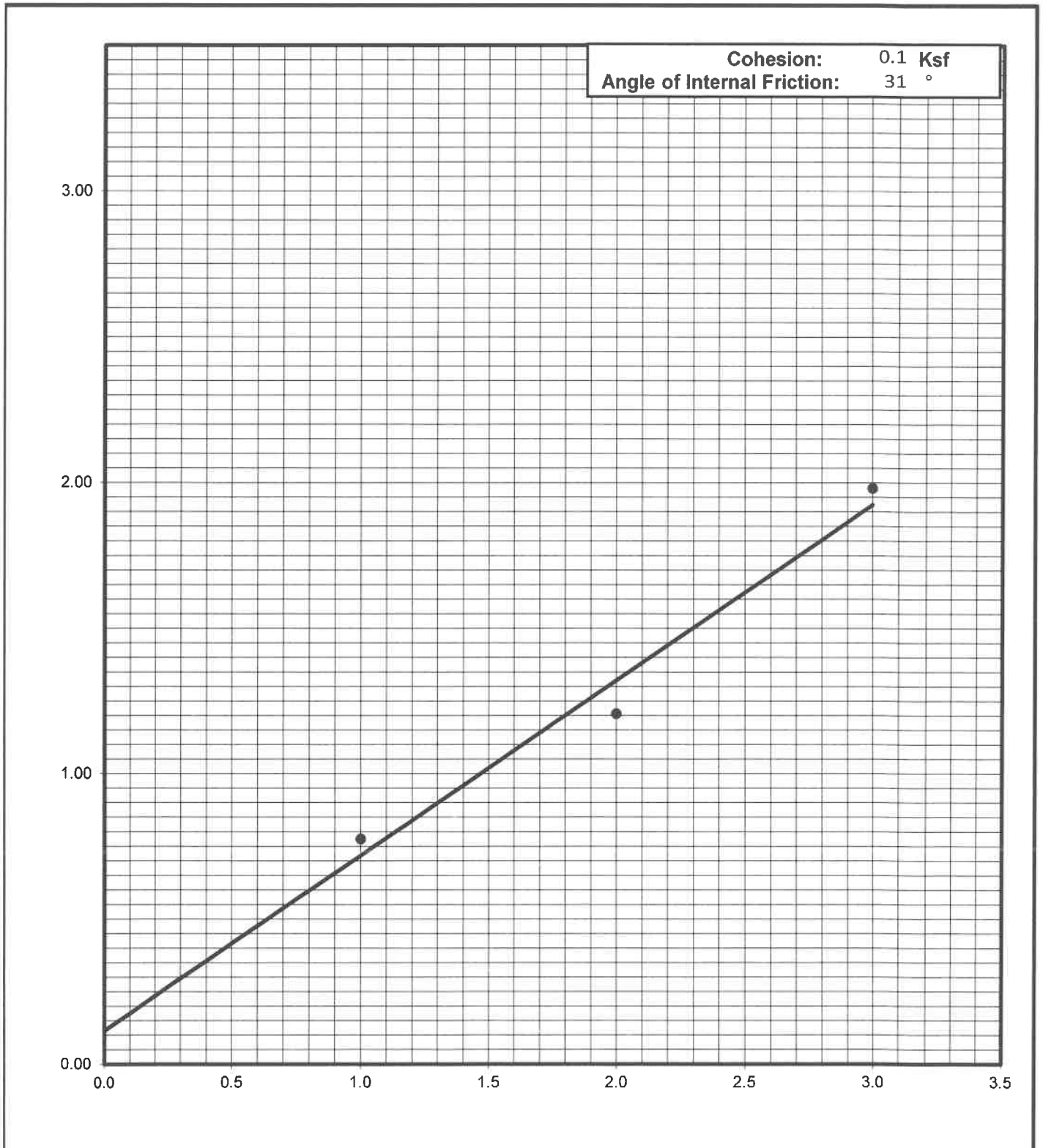
Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
012-25193	B1 @ 2-3'	9/17/2025	SC/CL

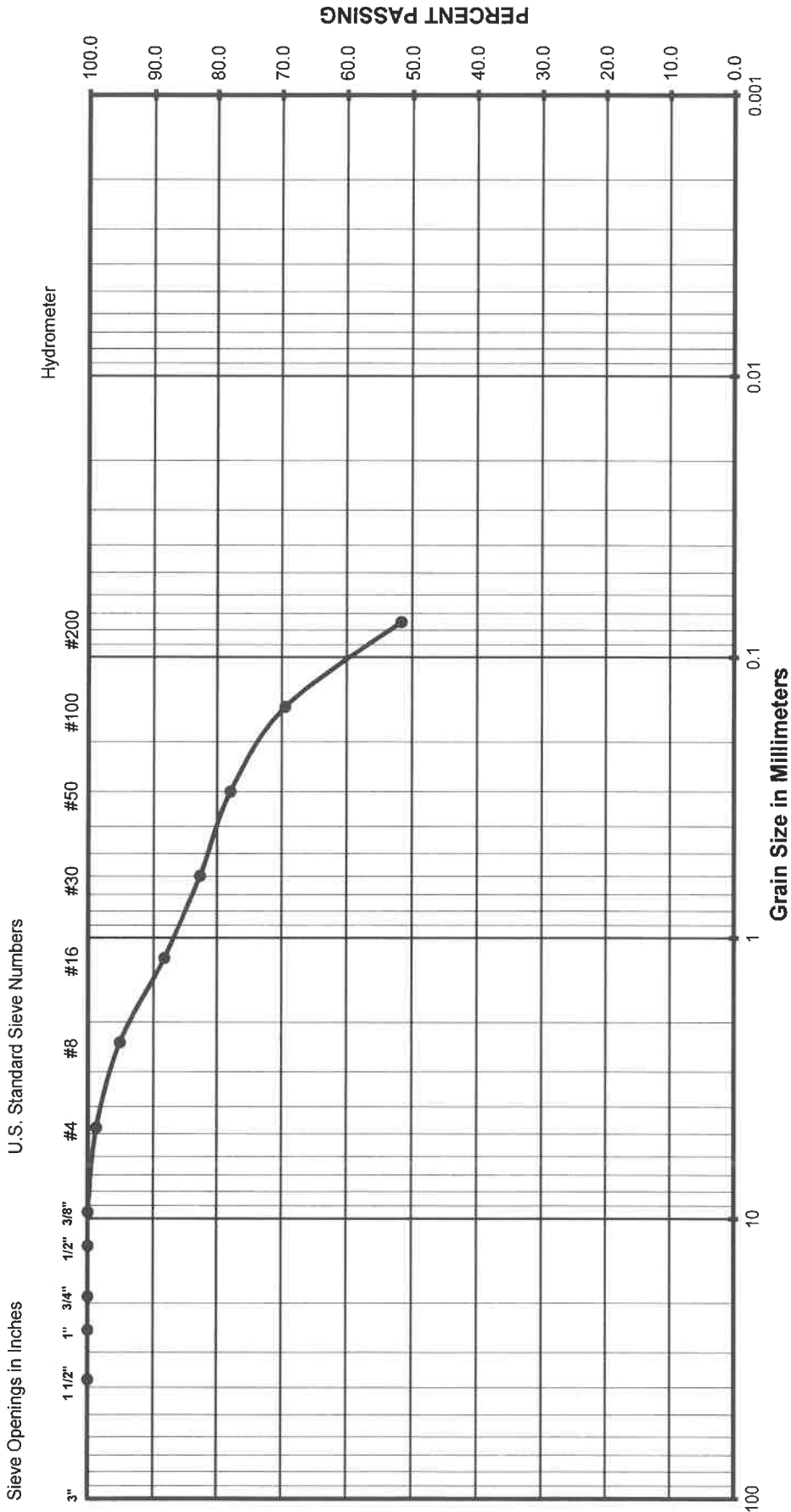


Shear Strength Diagram (Direct Shear)
ASTM D - 3080 / AASHTO T - 236

Project Number	Boring No. & Depth	Soil Type	Date
012-25193	B1 @ 5-6'	SM/ML	9/17/2025



Grain Size Analysis



Gravel		Sand		Silt or Clay
Coarse	Fine	Coarse	Fine	

(Unified Soils Classification)

Project Name
Project Number
Soil Classification
Sample Number

Los Banos PD Gun Range - PW
012-25193
SC/CL
B1 @ 2-3'

Expansion Index Test

ASTM D - 4829

Project Number : 012-25193
Project Name : Los Banos PD Gun Range - PW
Date : 9/9/2025
Sample location/ Depth : B1 @ 1-2'
Sample Number : X1
Soil Classification : CL

Trial #	1	2	3
Weight of Soil & Mold, gms	733.9		
Weight of Mold, gms	366.3		
Weight of Soil, gms	367.6		
Wet Density, Lbs/cu.ft.	110.9		
Weight of Moisture Sample (Wet), gms	200.0		
Weight of Moisture Sample (Dry), gms	176.0		
Moisture Content, %	13.6		
Dry Density, Lbs/cu.ft.	97.6		
Specific Gravity of Soil	2.7		
Degree of Saturation, %	50.6		

Time	Initial	30 min	1 hr	6hrs	12 hrs	24 hrs
Dial Reading	0	--	--	--	--	0.0836

Expansion Index_{measured} = 83.6

Expansion Index = **84**

Expansion Potential Table	
Exp. Index	Potential Exp.
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

APPENDIX B

EARTHWORK SPECIFICATIONS

GENERAL

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including but not limited to the furnishing of all labor, tools, and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans, and disposal of excess materials.

PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of Krazan and Associates, Inc., hereinafter known as the Soils Engineer and/or Testing Agency. Attainment of design grades when achieved shall be certified by the project Civil Engineer. Both the Soils Engineer and the Civil Engineer are the Owner's representatives. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory as determined by both the Soils Engineer and the Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Soils Engineer, Civil Engineer or project Architect.

No earthwork shall be performed without the physical presence or approval of the Soils Engineer. The Contractor shall notify the Soils Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

TECHNICAL REQUIREMENTS: All compacted materials shall be densified to a density not less than 90 percent relative compaction based on ASTM Test Method D1557 or CAL-216, as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be as determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the soil report.

The Contractor shall make his own interpretation of the data contained in said report, and the Contractor shall not be relieved of liability under the Contract documents for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or windblown materials attributable to his work.

SITE PREPARATION

Site preparation shall consist of site clearing and grubbing and the preparations of foundation materials for receiving fill.

CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter, and all other matter determined by the Soils Engineer to be deleterious or otherwise unsuitable. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed building areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots larger than 1 inch. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill of tree root excavations should not be permitted until all exposed surfaces have been inspected and the Soils Engineer is present for the proper control of backfill placement and compaction. Burning in areas which are to receive fill materials shall not be permitted.

SUBGRADE PREPARATION: Surfaces to receive Engineered Fill, building or slab loads shall be prepared as outlined above, excavated/scarified to a depth of 12 inches, moisture-conditioned as necessary, and compacted to 90 percent relative compaction.

Loose soil areas, areas of uncertified fill, and/or areas of disturbed soils shall be moisture-conditioned as necessary and recompact to 90 percent relative compaction. All ruts, hummocks, or other uneven surface features shall be removed by surface grading prior to placement of any fill materials. All areas which are to receive fill materials shall be approved by the Soils Engineer prior to the placement of any of the fill material.

EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over-excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence of the Soils Engineer. Material from the required site excavation may be utilized for construction site fills provided prior approval is given by the Soils Engineer. All materials utilized for constructing site fills shall be free from vegetation or other deleterious matter as determined by the Soils Engineer.

PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. However, compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer.

Both cut and fill areas shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill are as specified.

December 18, 2025

KA Project No. 012-25193

Mr. Tyler Fay
Westwood Professional Services, Inc.
1165 Scenic Drive
Modesto, California 95350

**RE: Percolation Testing
Los Banos PD Gun Range
Henry Miller Road (37.09700, -120.80642)
Los Banos, California**

Dear Mr. Fay:

As per your request, we have performed a field investigation including four (4) percolation testing for the proposed Los Banos PD Gun Range located at Henry Miller Road in Los Banos, California.

The purpose of this investigation is to evaluate the subsurface soils and geologic conditions of the site to determine the absorption characteristics of the on-site soils. Four (4) percolation tests were performed within the site a depth of 1 to 2 feet below the existing ground surface to evaluate the soil absorption characteristics. The percolation test locations are reflected on the attached site map.

For additional information about the soils encountered, please refer to the boring log attached.

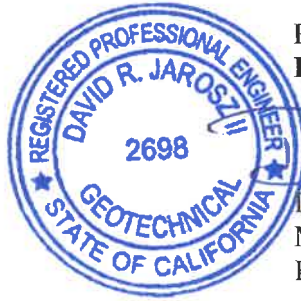
PERCOLATION TESTING

Four (4) percolation tests were performed within the site to evaluate the soils absorption characteristics. The percolation tests were performed within the test locations on the attached map. The percolation tests were performed at depths of 1 to 2 feet below the existing ground surface. The percolation tests were performed in the proposed leachfield areas. Results of the tests are as follows:

Perc No.	Depth (feet)	Percolation Rate (min/in)	Soil Type
P1	1	120	Sandy Clay (CL)
P2	2	90	Silty Sand/Sandy Silt (SM/ML)
P3	1	90	Silty Sand/Sandy Silt (Sm/ML)
P4	2	120	Sandy Clay (CL)

The test results indicate that the soils tested at a depth of 1 to 2 feet have fair to poor absorption characteristics. The test results do not include a factor of safety. The percolation rates given are based on 1 inch of fall within an 6-inch diameter hole with a 6-inch head of water.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (559) 348-2200.



Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

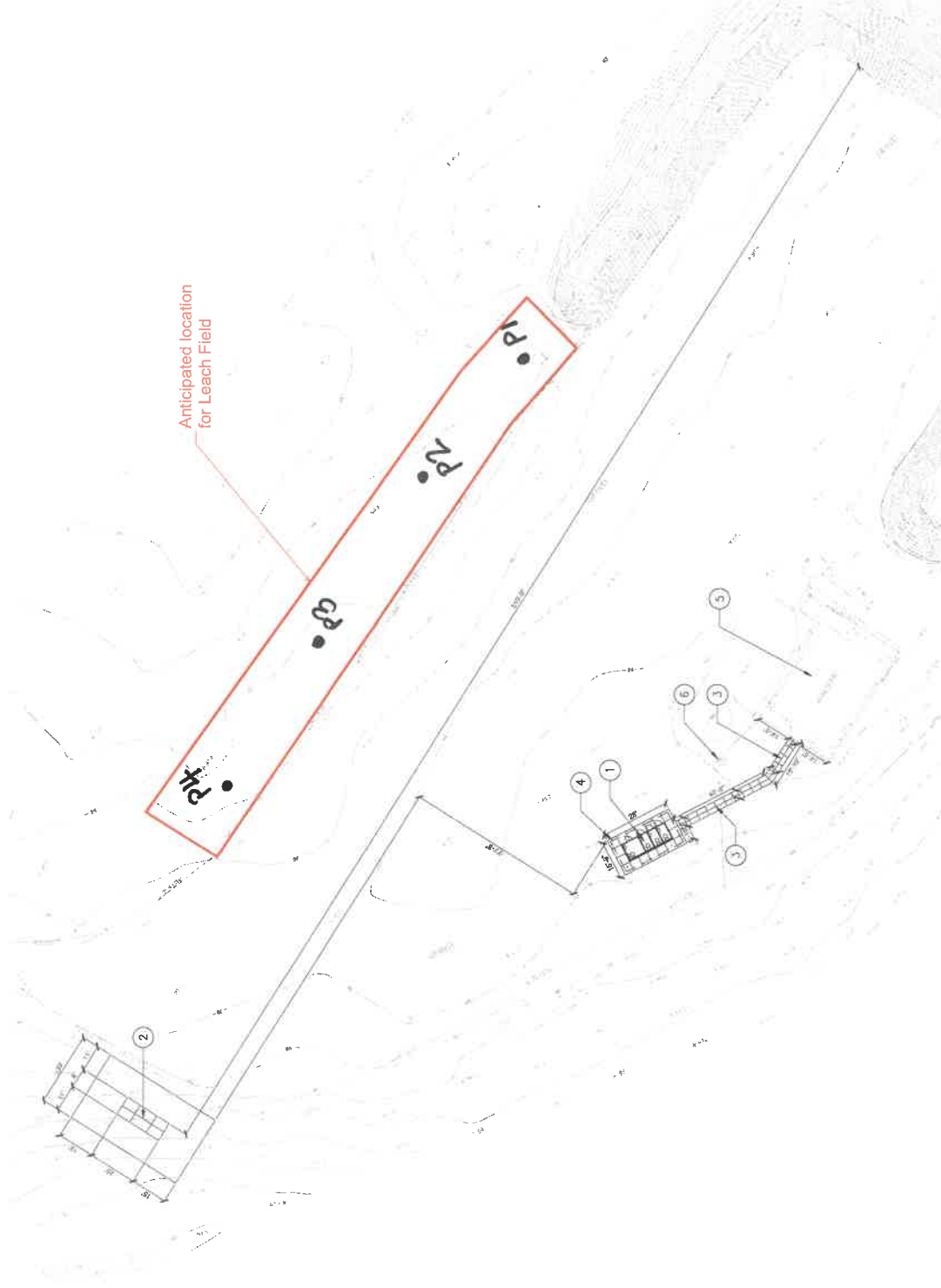
David R. Jarosz, II
Managing Engineer
RGE No. 2698/RCE No. 60185

DRJ:kw

LOS BANOS POLICE DEPARTMENT GUN RANGE

LEGEND

- 1 RESTROOM
- 2 20'x8' CONCRETE PAD
- 3 4" WIDE CONCRETE WALKWAY
- 4 SHADE STRUCTURE
- 5 EXISTING BUILDING
- 6 PRR& UTILITY POLE



DRAFT CONCEPT MASTER PLAN

10.14.2025

NOTE: THIS DOCUMENT IS FOR CONCEPTUAL PLANNING PURPOSES ONLY. THIS DOCUMENT IS MARKED PRELIMINARY AND NOT TO BE USED FOR CONSTRUCTION PURPOSES. ANY IMAGES SHOWN ARE TO CONVEY CONCEPT ONLY. CONSTRUCTION PLANS WILL HAVE TO BE DONE FOR BUDGET, CLASH DETECTION, CONCRETE TYPE, AND PAINT MATERIAL SELECTION.

Westwood
Westwood Engineering & Construction, Inc.