



**CITY OF TURLOCK
TURLOCK, CA**

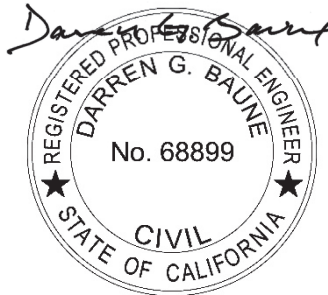
SURFACE WATER DISTRIBUTION SYSTEM IMPROVEMENTS PROJECT

CLIENT PROJECT NO. 18-69

**ADDENDUM NO. 3
TO THE
CONTRACT DOCUMENTS**

JULY 9, 2021

Digitally signed by Darren G. Baune
Contact Info: Carollo Engineers, Inc.
Date: 2021.07.09 15:08:42-07'00'



Bidders on the above-named project are hereby notified that the Bidding Documents are modified as indicated below. Bidders are required to acknowledge receipt of this Addendum in the space provided on the Document 00410 Bid Form.

This Addendum shall become part of the Contract and provisions of the Contract apply.

SPECIFICATIONS

The following sections are modified as indicated below.

1. DOCUMENT 00200 – INSTRUCTIONS TO BIDDERS:
 - a. REPLACE section in its entirety with the attached section.
2. DOCUMENT 00410 – BID FORM:
 - a. REPLACE section in its entirety with the attached section.
3. DOCUMENT 00520 – AGREEMENT:
 - a. REPLACE section in its entirety with the attached section.
4. DOCUMENT 00800 – SUPPLEMENTARY CONDITIONS:
 - a. REPLACE section in its entirety with the attached section.
5. DOCUMENT 01140 – WORK RESTRICTIONS:
 - a. REPLACE section in its entirety with the attached section.
6. DOCUMENT 01170 – NOVEL CORONAVIRUS (COVID-19) SAFETY REQUIREMENTS:
 - a. ADD attached section in its entirety.
7. DOCUMENT 01201 – PAYMENT PROCEDURES:
 - a. REPLACE section in its entirety with the attached section.
8. DOCUMENT 01220 – MEASUREMENT AND PAYMENT:
 - a. REPLACE section in its entirety with the attached section.
9. DOCUMENT 01460 – CONTRACTOR QUALITY CONTROL PLAN:
 - a. REPLACE section in its entirety with the attached section.
10. DOCUMENT 01756 – COMMISSIONING:
 - a. REPLACE section in its entirety with the attached section.
11. DOCUMENT 02050 – SOILS AND AGGREGATES FOR EARTHWORK:
 - a. REPLACE section in its entirety with the attached section.
12. DOCUMENT 02200 – SITE CLEARING:
 - a. REPLACE section in its entirety with the attached section.
13. DOCUMENT 02300 – EARTHWORK:
 - a. REPLACE section in its entirety with the attached section.
14. DOCUMENT 02318 – TRENCHING:
 - a. REPLACE section in its entirety with the attached section.

15. DOCUMENT 02600 – CONCRETE MANHOLES:
 - a. REPLACE section in its entirety with the attached section.
16. DOCUMENT 02742A – ASPHALTIC CONCRETE PAVING (CA):
 - a. REPLACE section in its entirety with the attached section.
17. DOCUMENT 02810 – IRRIGATION:
 - a. REPLACE section in its entirety with the attached section.
18. DOCUMENT 02820 – FENCES AND GATES:
 - a. REPLACE section in its entirety with the attached section.
19. DOCUMENT 03300 – CAST-IN-PLACE CONCRETE:
 - a. REPLACE section in its entirety with the attached section.
20. DOCUMENT 08710 – DOOR HARDWARE:
 - a. REPLACE section in its entirety with the attached section.
21. DOCUMENT 13207 – STRAND-WOUND CIRCULAR PRESTRESSED CONCRETE TANK WITH A TYPE I CORE WALL AND DOMED ROOF:
 - a. REPLACE section in its entirety with the attached section.
22. DOCUMENT 15052 – COMMON WORK RESULTS FOR GENERAL PIPING:
 - a. REPLACE section in its entirety with the attached section.
23. DOCUMENT 15114 – CHECK VALVES:
 - a. REPLACE section in its entirety with the attached section.
24. DOCUMENT 15116 – PLUG VALVES:
 - a. ADD attached section in its entirety.
25. DOCUMENT 17950 – COMMISSIONING FOR INSTRUMENTATION AND CONTROLS:
 - a. REPLACE section in its entirety with the attached section.
26. APPENDIX B – DRAFT STANISLAUS COUNTY ENCROACHMENT PERMIT:
 - a. REPLACE document in its entirety with the attached document.

DRAWINGS

The following drawings are modified as indicated below.

1. DRAWING 00TC02:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Pipe trench detail updated.
2. DRAWING 00TE05:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Electrical handhole detail updated.
3. DRAWING 00TP03:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Vertical pipe support detail updated.

4. DRAWING 00TP04:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Access tee assembly detail updated.
5. DRAWING 10P04:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Fiber optic cable routing updated.
6. DRAWING 10P08:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Joint restraint length updated.
7. DRAWING 10C07:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Legend updated.
8. DRAWING 10C08:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Legend updated.
9. DRAWING 10C09:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Legend updated.
10. DRAWING 10C10:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Legend updated and roadway section detail added.
11. DRAWING 10C11:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Legend updated.
12. DRAWING 20S02:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Overflow line size updated.
13. DRAWING 20S03:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Detail updated.
14. DRAWING 20S04:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Overflow line size and pipe penetration details updated.
15. DRAWING 20S05:
 - a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Pipe penetration detail updated.

16. DRAWING 10N01:

- a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Detail for pullbox layout added.

17. DRAWING 40L01:

- a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Sleeve sizes updated.

18. DRAWING 40L02:

- a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Valve added.

19. DRAWING 40L03:

- a. REPLACE drawing in its entirety with the attached drawing.
 - 1) Sleeve sizes updated.

DOCUMENT 00200

INSTRUCTIONS TO BIDDERS

ARTICLE 1 - DEFINED TERMS

- 1.01 Terms used in this Document will have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in this Document have the meanings indicated below:
- A. Issuing Office -- The office from which the Bidding Documents are to be issued.
 - B. Successful Bidder -- The lowest responsible Bidder submitting a responsive Bid to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award.
 - C. Responsive Bidder - Means a Bidder who has submitted a Bid which conforms in all material respects to the Bidding Documents.
 - D. Responsible Bidder - Means a Bidder who has the capacity and capability in all respects to perform fully the contract requirements and who has the integrity and reliability to assure good faith performance.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

- 2.01 Complete sets of the Bidding Documents may be obtained from the Issuing Office in the number and format stated in the advertisement or invitation to bid.
- 2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

- 3.01 More than one (1) Bid from an individual, firm, partnership, corporation, or association under the same or different names will not be considered. If the Owner believes that any Bidder submits more than one (1) Bid for the Work contemplated, all Bids in which such Bidder is interested will be rejected. If the Owner believes that collusion exists among the Bidders, all Bids will be rejected.
- 3.02 Provide proof of registration with the California Department of Industrial Relations (DIR) in the form of a PDF extract from DIR Public Works Registration website.

- 3.03 Pursuant to Section 4105, California Public Contract Code, Bidder may not circumvent the requirement to list subcontractors by the device of listing 1 subcontractor, who in turn sublets portions constituting the majority of the work covered by the contract.
- 3.04 No Contractor or Subcontractor may submit a Bid or perform Work on this Project who is found in violation of California Labor Code Division 2, Part 7, Chapter 1 by the Labor Commissioner. Subcontractors who have been disbarred may not receive public funds pursuant to California Public Contract Code §6109.
- 3.05 The Bidder is required to have minimum qualifications to submit a Bid. To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit written evidence establishing its qualifications by submitting Document 00451 - Construction Contractor's Required Qualifications and Statement.
- 3.06 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- 3.07 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.
- 3.08 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

ARTICLE 4 - SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

4.01 Site and Other Areas:

- A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

4.02 Existing Site Conditions:

- A. Subsurface and Physical Conditions; Hazardous Environmental Conditions:
 - 1. The Supplementary Conditions identify:
 - a. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.
 - b. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
 - c. reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.
 - d. Technical Data contained in such reports and drawings.
 - 2. Owner will make copies of reports and drawings referenced above available at the cost of reproduction to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any

Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

- B. Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.
- C. Adequacy of Data: Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 5.03, 5.04, and 5.05 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 5.06 of the General Conditions.

4.03 Site Visit and Testing by Bidders:

- A. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.
- B. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site.
- C. Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.
- D. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

4.04 Owner's Safety Program:

- A. Site visits and work at the Site may be governed by an Owner safety program. As the General Conditions indicate, if an Owner safety program exists, it will be noted in the Supplementary Conditions.

4.05 Other Work at the Site:

- A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 5 - BIDDER'S REPRESENTATIONS

5.01 It is the responsibility of each Bidder before submitting a Bid to:

- A. Examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents.
- B. Visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Carefully study all:
 - 1. Reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
 - 2. Reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawing.
- E. Consider the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on:
 - 1. The cost, progress, and performance of the Work.
 - 2. The means, methods, techniques, sequences, and procedures of construction to be employed by Bidder.
 - 3. Bidder's safety precautions and programs.
- F. Agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

- G. Become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder.
- I. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.
- J. Agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 6 - PRE-BID CONFERENCE

- 6.01 A mandatory pre-Bid conference will be held at the time and location stated in the invitation or advertisement to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are required to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

- 7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all parties recorded as having received the Bidding Documents. Questions received less than 7 calendar days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 7.02 Addenda may be issued to clarify, correct, supplement, or change the Bidding Documents.

ARTICLE 8 - BID SECURITY

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 10 percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a certified check, bank money order, or Document 00432 - Bid Bond issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.
- 8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract Documents,

furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released:

- A. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.

8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Contract or 90 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within seven days after the Bid opening.

ARTICLE 9 - CONTRACT TIMES

9.01 The number of days within which, or the dates by which the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 - LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, of any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in Document 00520 - Agreement.

ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or "or-equal" items.

- A. In cases in which the Contract allows the Contractor to request that Engineer authorize the use of a substitute or "or-equal" item of material or equipment, application for such acceptance may not be made to and will not be considered by Engineer until after the Effective Date of the Contract.

11.02 In accordance with Section 3400 of the California Public Contract Code, the successful Bidder is permitted a period of 30 days after the award of contract for submission of data substantiating a request for a substitution of an "or equal" item.

11.03 Prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as amended by Addenda.

- A. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 12 - SUBCONTRACTORS, ~~SUPPLIERS, AND OTHERS~~^{AD3}

- 12.01 A Bidder shall be prepared to retain specific Subcontractors, ~~Suppliers, or other individuals or entities~~^{AD3} for the performance of the Work if required by the Bidding Documents (most commonly in the Specifications) to do so. If a prospective Bidder objects to retaining any such Subcontractor, ~~Supplier, or other individual or entity~~^{AD3} and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.
- 12.02 Subsequent to the submittal of the Bid, Owner may not require the Successful Bidder or Contractor to retain any Subcontractor, ~~Supplier, or other individual or entity~~^{AD3} against which Contractor has reasonable objection.
- 12.03 Pursuant to California Public Contract Code §4106, Document 00434 - Proposed Subcontractors List shall list the Subcontractors ~~or Suppliers~~^{AD3} proposed who will perform work or labor or render services in an amount in excess of 1/2 of 1 percent of Contractor's total bid. The apparent Successful Bidder, and any other Bidder pursuant to California Public Contract Code §4104 so requested, shall within twenty-four hours after Bid opening, submit to Owner any additional information requested by Owner in Document 00434 - Proposed Subcontractors Form, other than: 1) the name, 2) the location of the business, 3) the California contractor license number, and 4) the Department of Industrial Relations registration number of each proposed subcontractor. The information in items 1) through 4) above must be set forth on Document 00434 - Proposed Subcontractors List, and attached to Document 00410 - Bid Form.
- A. If requested by Owner, such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, ~~Supplier, or other individual or entity~~^{AD3}. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, ~~Supplier, individual, or entity~~^{AD3}, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder shall submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.
- 12.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, ~~Suppliers, or other individuals or entities~~^{AD3}. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, ~~Supplier, individual, or entity~~^{AD3} so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.06 of the General Conditions.

ARTICLE 13 - PREPARATION OF BID

- 13.01 Document 00410 - Bid Form is included with the Bidding Documents.
- A. Complete each blank on Document 00410 - Bid Form in ink and the Bid Form signed in ink.

- B. The person signing the Bid Form must initialed in ink erasures or alterations.
 - C. Indicate Bid Price for each section, Bid item, alternative, adjustment unit price item, and unit price item listed therein.
 - D. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."
- 13.02 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation must be shown.
- 13.03 A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.
- 13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.
- 13.05 A Bid by an individual shall show the Bidder's name and official address.
- 13.06 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on Document 00410 - Bid Form. The official address of the joint venture shall be shown.
- 13.07 All names shall be printed in ink below the signatures.
- 13.08 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on Document 00410 - Bid Form.
- 13.09 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.
- 13.10 The Bid shall contain evidence of Bidder's authority and qualification to do business in California, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on Document 00410 - Bid Form. Questions concerning a contractor may be referred to the Registrar, Contractors' State License Board, P.O. Box 26000, Sacramento, CA 95826.
- 13.11 Pursuant to the provisions of Section 6707, California Labor Code, Bids shall contain, as a Bid item, the cost for adequate sheeting, shoring and bracing, or equivalent method, for the protection of life and limb in trenches and open excavation, which shall conform to applicable safety orders.
- 13.12 Pursuant to the provisions of Section 7106 of the California Public Contract Code, Bidders shall submit with their Bids, a Non-Collusion Affidavit, Document 00456 - Non-Collusion Affidavit.

~~13.13 Pursuant to Section 7105, California Public Contract Code, Bidder shall indicate, in the appropriate space provided in Document 00410 - Bid Forms, the cost of insurance~~

~~premiums for earthquake and tidal wave to indemnify Owner for damage to the Work caused by earthquake or tidal wave in an amount of at least 50 percent of the contract price. The determination of whether to require earthquake and tidal wave insurance will be made by Owner prior to award of contract.~~^{AD2}

ARTICLE 14 - BASIS OF BID

14.01 Base Bid with Alternates:

- A. Bidders shall submit a Bid on a unit price basis for the base Bid and include a separate price for each alternate described in the Bidding Documents and as provided for in Document 00410 - Bid Form. The price for each alternate will be the amount added to or deleted from the base Bid if Owner selects the alternate.

14.02 Unit Price:

- A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the unit price section of Document 00410 - Bid Form.
- B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity" (which Owner or its representative has set forth in the Bid Form) for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The quantities of work or material stated in unit price items of the Bid are supplied only to give an indication of the general scope of the Work; the Owner does not expressly or by implication agree that the actual amount of work or material will correspond therewith. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.
- C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

14.03 Allowances:

- A. For cash allowances the Bid price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 13.02.B of the General Conditions.

14.04 Evaluation of bids containing alternates:

- A. In the evaluation of Bids for the basis of award, the lowest Bid shall be the lowest Bid price on the Base Bid without consideration of the Bid Alternates additive or deductive items.

ARTICLE 15 - SUBMITTAL OF BID

- 15.01 With each copy of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 7 of the Bid Form.
- 15.02 A Bid shall be received no later than the date and time prescribed and at the place indicated in the Document 00100 – Advertisement for Bids and shall be enclosed in a plainly marked package with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents.
- A. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to City of Turlock Engineering Division, 156 S. Broadway, Suite 150, Turlock, CA 95380.
- 15.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

- 16.01 A Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.
- 16.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 16.01 and submit a new Bid prior to the date and time for the opening of Bids.
- 16.03 Unauthorized conditions, limitations, or modifications attached to the Bid will render it informal and may cause its rejection as being non-responsive. The completed Document 00410 - Bid Forms shall be without interlineations, alterations, or erasures. Any changes or corrections shall be initialed by the Bidder. Alternative Bids will not be considered unless expressly called for in Document 00100 - Invitation to Bid. Oral, telegraphic, faxed or telephone Bids or modifications will not be considered.
- 16.04 In accordance with Sections 5101 and 5103, California Public Contract Code, withdrawal of Bids may be permitted for mistakes made in filling out the Bid but will not be permitted for mistakes resulting from errors in judgment or carelessness in inspecting the site of the work or in reading the drawings, specifications, and other Contracts Documents.
- 16.05 In the event Bidder alleges that a clerical error has been made in the list of subcontractors, the procedures for substitution shall be provided in accordance with Section 4107.5, California Public Contract Code.

ARTICLE 17 - OPENING OF BIDS

- 17.01 Bids will be opened at the time and place indicated in Document 00100 - Advertisement for Bids and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.
- 17.02 The 3 lowest Bidders shall submit within 72 hours of the Bid opening, 1 copy of all documentary information generated in preparation of Bid prices for this Project, pursuant to Document 00823 - Escrow Bid Documents.

ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

- 18.01 All Bids will remain subject to acceptance for the period of time stated in Document 00410 - Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 - EVALUATION OF BIDS AND AWARD OF CONTRACT

- 19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder.
- 19.02 If Owner awards the contract for the Work, such award shall be to the responsible Bidder submitting the lowest responsive Bid.
- 19.03 More than 1 Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than 1 Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.
- 19.04 Evaluation of Bids:
- A. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in Document 00410 - Bid Form or prior to Document 00510 - Notice of Award.
 - B. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.

19.05 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

19.06 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

~~19.07 If the Contract is to be awarded, Owner will award the Contract to the Bidder whose Bid is in the best interests of the Project.~~^{AD3}

ARTICLE 20 - BONDS AND INSURANCE

20.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the Agreement (executed by Successful Bidder) to Owner, it shall be accompanied by required bonds and insurance documentation.

ARTICLE 21 - SIGNING OF AGREEMENT

21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder shall execute and deliver the required number of counterparts of the Agreement (and any bonds and insurance documentation required to be delivered by the Contract Documents) to Owner. Within ten days thereafter, Owner shall deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 22 - SALES AND USE TAXES

22.01 Contractor shall pay all sales, use and other taxes as specified in paragraph 6.10 of the General Conditions.

ARTICLE 23 - CONTRACTS TO BE ASSIGNED

23.01 Surface Water Distribution System Improvements Project – Pump, Motor, and VFD Systems Equipment Procurement. Refer to specification 01640 and Appendix I for all requirements.

ARTICLE 24 - RETAINAGE

24.01 Provisions concerning Contractor's rights to deposit securities in lieu of retainage are set forth in Document 00520 - Agreement.

ARTICLE 25 - PARTNERING

25.01 See Section 01305 for Project Partnering requirements.

ARTICLE 26 - LAWS AND REGULATIONS

26.01 Prevailing Wage Rates: Pursuant to Section 1770 et seq., California Labor Code, the successful Bidder shall pay not less than the prevailing rate of per diem wages as determined by the Director of California Department of Industrial Relations. A copy of such prevailing rate is on file at the offices of the City Clerk, Turlock, California, which copy will be made available for examination during business hours to any party on request.

A. Pursuant to California SB854, Contractor and subcontractor must submit certified payroll records (CPRs) to the Labor Commissioner.

26.02 Contractor's License Classification: In accordance with the provisions of California Business and Professions Code, Section 7028, Owner has determined that Contractor shall possess a valid Class A Contractor License at the time of Bid and for the duration of the contract. Failure to possess the specified license shall render the Bid as non-responsive and shall act as a bar to award of the contract to any Bidder not possessing said license at the time of Bid opening.

26.03 The Contractors' State License Board may be contacted at 9821 Business Park Drive, Sacramento, CA 95827; P.O. Box 26000, Sacramento, CA 95826; (800) 321-2752.

26.04 In accordance with California Civil Code, Section 3247, a payment bond is required.

26.05 In accordance with California Public Contract Code, Section 22300, Contractor may substitute securities in place of retained funds, as provided in Document 0062B - Escrow Agreement for Security Deposits in Lieu of Retention.

ARTICLE 27 - PREVAILING WAGE RATES

27.01 Pursuant to Section 1770 et. seq., California Labor Code, the successful Bidder shall pay not less than the prevailing rate of per diem wages as determined by the Director of California Department of Industrial Relations.

27.02 A copy of such prevailing rate is on file at the Owner's offices.

A. A copy will be made available for examination during business hours to any party on request.

27.03 The project is subject to compliance monitoring and enforcement by the California Department of Industrial Relations.

END OF DOCUMENT

AD3 Addendum No. 3

AD2 Addendum No. 2

DOCUMENT 00410

BID FORM

ARTICLE 1 - BID RECIPIENT

1.01 Project Identification:

City of Turlock
Development Services Department/Engineering Division
Surface Water Distribution System Improvements Project
City of Turlock Project No. 18-69

1.02 This Bid is submitted to:

City of Turlock
Development Services Department/Engineering Division
156 South Broadway, Suite 150
Turlock, CA 95380 - 5454

1.03 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents within the specified time and for the price indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 - BIDDER'S ACKNOWLEDGMENT

2.01 Bidder accepts all of the terms and conditions of Document 00200 - Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. The Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 - BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

- A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

- B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and has satisfied itself as to all Federal, state, and local Laws and Regulations and Permits that may affect cost, progress, and performance of the Work.
- D. Bidder has carefully studied all:
 - 1. Reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
 - 2. Reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
- E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on:
 - 1. The cost, progress, and performance of the Work.
 - 2. The means, methods, techniques, sequences, and procedures of construction to be employed by Bidder.
 - 3. Bidder's safety precautions and programs.
- F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing the Work required by the Bidding Documents.
- J. In accordance with Section 1861, California Labor Code, the Bidder states the following as its certification:
 - 1. "I am aware of the provisions of Section 3700 of the California Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work."

ARTICLE 4 - BIDDER'S CERTIFICATION

4.01 Bidder further represents:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation.
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham bid.
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding.
- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this paragraph:
 - 1. "Corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
 - 2. "Fraudulent practice" means an intentional misrepresentation of facts made:
 - a. To influence the bidding process to the Owner's detriment.
 - b. To establish bid prices at artificial non-competitive levels.
 - c. To deprive Owner of the benefits of free and competitive bidding process.
 - 3. "Collusive practice" means a scheme or arrangement between two or more Bidders with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
 - 4. "Coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.
 - 5. Pursuant to California Public Contract Code Section 7103.5(b), Contractor or Subcontractor shall offer and agree to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code).

ARTICLE 5 - ASSIGNMENTS AND ALLOWANCES

5.01 See Section 00200 for contracts to be assigned.

5.02 Bidder shall provide the Owner with an allowance for Bid Items described as an allowance. The Owner, at Owner's option, will use this allowance for work described in Section 01220 for each Bid Item. For allowance work, the Contractor shall submit the appropriate invoices to the Owner with pay requests. Allowance are included in the unit price schedule.

ARTICLE 6 - BASIS OF BID

6.01 Bidder will complete the Work in accordance with the Contract Documents for the following Unit Price Bid of:

BASE BID					
Bid Item Number	Description	Unit	Estimated Quantity	Unit Price	Total Amount
1	Mobilization and Demobilization (Not to be Greater than 4 percent of the Total Unit Price Bid)	LS	1	\$	\$
2	Terminal Tank Site Sitework	LS	1	\$	\$
3	Terminal Tank Site Concrete Reservoir	LS	1	\$	\$
4	Terminal Tank Site Pump Station	LS	1	\$	\$
5	Terminal Tank Site Detention Basin	LS	1	\$	\$
6	Terminal Tank Site Detention Basin Pump Station	LS	1	\$	\$
7	Traffic Control	LS	1	\$	\$
8	Subsurface Utility Investigations	LS	1	\$	\$
9	42-inch Potable Pipeline	LF	5,451	\$	\$
10	24-inch Potable Pipeline	LF	1,377	\$	\$
11	16-Inch Potable Pipeline	LF	4,777	\$	\$
12	Blow-Off Valves	EA	10	\$	\$
13	3-inch Air Valve Assemblies	EA	6	\$	\$
14	8-inch Air Valves Assemblies	EA	2	\$	\$
15	Inspection Manways	EA	3	\$	\$
16	Potable Pipeline Valves, Connections, and Tie-ins	LS	1	\$	\$
17	15-Inch Storm Drain Pipeline	LF	2,866	\$	\$

BASE BID					
Bid Item Number	Description	Unit	Estimated Quantity	Unit Price	Total Amount
18	Storm Drain Pipeline Manholes	EA	10	\$	\$
19	Fiber Optic Conduit and Cable	LS	1	\$	\$
20	Fiber Optic Pull Boxes	EA	21	\$	\$
21	Wellington / East Christofferson PRV	LS	1	\$	\$
22	East Monte Vista / Brookstone PRV	LS	1	\$	\$
23	Quincy / Sebastian PRV	LS	1	\$	\$
24	Stanislaus County Paving – 4-inch HMA over 6-inch ABC <u>0.45-foot Asphalt over 0.55-foot ABC^{AD3}</u>	SY	7,293	\$	\$
25	Stanislaus County Paving – 2-inch Grind and Overlay	SY	6,885	\$	\$
26	Stanislaus County Paving – ABC Shoulder	SY	1,002	\$	\$
27	City of Turlock Paving – 2-inch Grind and Overlay	SY	16,475	\$	\$
28	City of Turlock Paving – Pavers	SY	186	\$	\$
29	City of Turlock ADA Ramp, Sidewalk, Curb and Gutter	LS	1	\$	\$
30	Pavement Striping	LS	1	\$	\$
31	Phase 1 Commissioning	LS	1	\$	\$
32	Maintenance of pump station, tank, and all Terminal Tank Site facilities between Phase 1 and Phase 2 Commissioning	MO	4	\$	\$
33	Phase 2 Commissioning	LS	1	\$	\$
34	Dust Control	LS	1	\$	\$

BASE BID					
Bid Item Number	Description	Unit	Estimated Quantity	Unit Price	Total Amount
35	Dewatering for Trenches and Open Excavations	LS	1	\$	\$
36	Allowance for Stanislaus County and City of Turlock Encroachment Permit Fees	AL	1	\$75,000	\$75,000
37	<u>Allowance for Turlock Irrigation District New Electrical Service Fees</u>	<u>AL</u>	<u>1</u>	<u>\$45,000</u>	<u>\$45,000</u> ^{AD2}
37 <u>38</u>	Allowance for Culvert Repairs	AL	1	\$50,000	\$50,000
38 <u>39</u>	Allowance for Unknown Utilities	AL	1	\$50,000	\$50,000
39 <u>40</u>	Allowance for Disputes Review Board per Section 00822	AL	1	\$25,000	\$25,000
40 <u>41</u>	Allowance for Project Partnering per Section 01305	AL	1	\$35,000	\$35,000
41 <u>42</u>	Sheeting, Shoring, and Bracing, or Equivalent Method for the Protection of Life and Limb in Trenches and Open Excavation, Pursuant to California Labor Code §6707 and Section 02260	LS	1	\$	\$
42 <u>43</u>	All other work required to complete the project that is not included in Bid Items 1 – 41 <u>42</u> ^{AD2} .	LS	1	\$	\$
Total	Total Unit Price Bid (Bid Items 1 - 42 <u>43</u> ^{AD2})				
	\$ _____				\$ _____
	(in words)				(in figures)

6.02 Bid Alternatives:

- A. Bidder offers to make, at the bid alternate prices following, the changes in the Work covered by the Unit Prices that are specified in the bid alternates priced below.
- B. It is understood that:
 1. All bid alternate prices must be filled in.
 2. The acceptance or rejection of any or all of these bid alternates is at the option of Owner.
 3. Acceptance or rejection of bid alternates will not necessarily be made on the basis of price alone.

4. The acceptance or rejection of one or more bid alternates will not affect the Lump Sum Bid Price, nor other conditions of this Bid, nor the price of other accepted bid alternates.
5. If the Bid Alternate is a positive number it is an increase (addition) to the Base Bid. If the Bid Alternate is a negative number it is a decrease (deduction) to the Base Bid. The net addition or net deduction that is to be applied to the Lump Sum Bid Price of the undersigned if the bid alternate is accepted by Owner.
6. The Contract Price shall be the net amount determined by applying the bid alternate prices of all accepted bid alternates to the Total Unit Price Bid.

C. Bid Alternate A – Eliminate Future Switchgear for Pump Station Expansion:

1. Bidder agrees to modify the Total Unit Price Bid the amount shown below for all labor, equipment, materials, insurance, and all other work necessary to not install the electrical switchgear and electrical conductors to and from the switchgear needed for the future pump station expansion as indicated on the Drawings. Conduit to and from the switchgear needed for the future pump station expansion is included in the base bid.

Description	Unit	Estimated Quantity	Unit Price	Total Amount
Bid Alternate A	LS	1	\$	\$

D. Bid Alternate B – Eliminate Detention Basin Pump Station, 15-inch Storm Drain Pipeline, Storm Drain Manholes, and Associated Work:

1. Bidder agrees to modify the Total Unit Price Bid the amount shown below for all labor, equipment, materials, insurance, permits, traffic control, temporary and permanent pavement, testing, and all other work necessary to not install the Detention Basin Pump Station and associated site work, electrical and instrumentation equipment, not install the 15-inch Storm Drain Pipeline and Storm Drain Manholes from the Detention Basin Pump Station to Chistoffersen Parkway. If the Owner accepts this bid alternate, Contractor shall adjust the location of the 24-inch diameter potable water pipeline in Quincy Road into the center of the western lane.

Description	Unit	Estimated Quantity	Unit Price	Total Amount
Bid Alternate B	LS	1	\$	\$

E. Bid Alternate C – Eliminate Phase 2 Commissioning – Temporary Pumping to the Distribution System and Associated Work:

1. Bidder agrees to modify the Total Unit Price Bid the amount shown below for all labor, equipment, materials, insurance, permits, temporary pumps, piping appurtenances, testing, and all other work necessary to not perform the Temporary Pumping to the Distribution System in Phase 2 Commissioning and commencing Phase 2 Commissioning with the Project Commissioning and Operational Period as defined in Section 01756. This bid alternate eliminates the 90 calendar days of temporary pumping and reduces the substantial completion and final completion duration by 90 calendar days.

Description	Unit	Estimated Quantity	Unit Price	Total Amount
Bid Alternate C	LS	1	\$	\$

ARTICLE 7 - TIME OF COMPLETION

- 7.01 Bidder agrees that the Work will be substantially completed, and, completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days as specified in Document 00520 - Agreement.
- 7.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the times specified above, which shall be as specified in Document 00520 - Agreement.

ARTICLE 8 - ATTACHMENTS TO THIS BID

- 8.01 The following documents are attached to and made a condition of this Bid:
- A. Document 00432 - Bid Bond. Required Bid security in the form of cash, a certified or bank check, or a Bid Bond as specified in Document 00432.
 - B. Document 00434 - Proposed Subcontractors Form.
 - C. Document 00436 - List of Equipment Manufacturers.
 - D. Document 00451 - Construction Contractor's Required Qualifications and Statement.
 - E. Document 00452 - Affirmative Action Program Certificate.
 - F. Document 00456 - Non-Collusion Affidavit.
 - G. Document 00458 - Certification of Drug-Free Workplace Requirements.
 - H. Document 00500 - Iran Contracting Act Certification
 - I. Document 00506 - Public Works Contractor Registration Certification

ARTICLE 9 - DEFINED TERMS

- 9.01 The terms used in this Bid with initial capital letters or all capital letters have the meanings as specified in Document 00200 - Instructions to Bidders, General Conditions, and Supplementary Conditions.

ARTICLE 10 - BID SUBMITTAL

SUBMITTED on _____, 20__.

State Contractor License Number _____. (If applicable)

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____
(Individual's signature)

Doing business as: _____

Business address: _____

Phone Number: () _____ FAX Number: () _____

A Partnership

Partnership Name: _____

By: _____
(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Business address: _____

Phone Number: () _____ FAX Number: () _____

A Corporation

Corporation Name: _____

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability):

By: _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Attest: _____
(Signature of Corporate Secretary, Acting Secretary or other officer)

Business address: _____

Phone Number: () _____ FAX Number: () _____

Date of Qualification to do business is _____

A Joint Venture

Joint Venturer Name: _____

By: _____
(Signature of joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

Phone Number: () _____ FAX Number: () _____

Joint Venturer Name: _____

By: _____
(Signature of joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

Phone Number: () _____ FAX Number: () _____

Phone and FAX Number, and Address for receipt of official communications:

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

END OF DOCUMENT

AD3 Addendum No. 3

AD2 Addendum No. 2

DOCUMENT 00520

AGREEMENT

THIS AGREEMENT is by and between City of Turlock, a Municipal Corporation, (Owner) and _____ (Contractor). Owner and Contractor hereby agree as follows:

RECITALS

- A. Owner has taken appropriate proceedings to authorize construction of the public work and improvements herein provided and execution of this contract.
- B. A notice was duly published for bids for the contract for the improvements hereinafter described pursuant to Public Contract Code § 20164.
- C. On _____, 2021, after notice duly given, the City Council of the City of Turlock awarded the contract for the construction of the improvements hereinafter described to Contractor, which Contractor said Council found to be as the lowest responsive and responsible bidder for said improvements.
- D. Owner and Contractor desire to enter into this Agreement for the construction of said improvements.

ARTICLE 1 - WORK

- 1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents for completion of the Project.

ARTICLE 2 - THE PROJECT

- 2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as constructing approximately 2.3 million gallon concrete tank, 12 million gallon per day pump station and building, detention basin and storm water pump station, 12,000 linear feet of 16-inch to 54-inch diameter potable water pipeline and appurtenances, 2,500 linear feet of 15-inch storm drain pipeline and manholes, three pressure reducing valve vaults, pavement improvements, associated grading, structural mechanical, electrical, and instrumentation equipment, and all work necessary to provide a complete and operational facility to convey treated potable water from the City's Terminal Tank to the potable water distribution system.

ARTICLE 3 - ENGINEER

- 3.01 The Project has been designed by Carollo Engineers, Inc. ("Design Engineer").

- 3.02 The Owner will retain a construction manager ("Construction Manager" or "CM") to act as Owner's representative.
- 3.03 The term "Engineer" shall refer to either the Construction Manager or Design Engineer based on their roles as defined in Section 00800, SUPPLEMENTARY CONDITIONS, and their separate contracts with the Owner.

ARTICLE 4 - CONTRACT TIMES

4.01 Time of the essence:

- A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 Contract Times: Calendar Days:

- A. The Work will be substantially completed within 665 calendar days after the date when the Contract Times commence to run as provided in paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with paragraph 15.06 of the General Conditions within 695 calendar days after the date when the Contract Times commence to run.
- B. Parts of the Work shall be substantially completed consistent with the following Milestones:
1. Within 30 calendar days of Notice to Proceed, submit all equipment and materials submittals needed for the following: all piping, duct banks, and materials below the pump station slab, pump station electrical equipment submittals that impact pump station slab design, conduit, and all other submittals to start construction the pump station. Construction of the pump station is critical path for the project.
 2. Within 30 calendar days of Notice to Proceed, submit for review and approval the pipeline product data needed to order the materials for the terminal tank, pump station piping, and all off-site pipelines.
 3. Within 30 calendar days of Notice to Proceed, install construction trailers for Engineer and Construction Manager.
 4. Within 30 calendar days of Notice to Proceed, commence potholing of existing utilities per Section 02280. Complete potholing activities within 75 calendar days of Notice to Proceed.
 5. Within 60 days of Notice to Proceed, submit for review and approval generator product data needed to order the generator and the Authority to Construct application with the San Joaquin Valley Air Pollution Control District.
 6. Within 45 days of completing potholing, submit for review and approval pipeline layout drawings of the entire pipeline alignment. Portions of the alignment shall be submitted earlier where required beneath the pump station.
 7. By April 23, 2022 complete:
 - a. All ground disturbing work (including potable and storm drain pipelines, fiber optic conduit and pull boxes, cathodic protection, manholes, appurtenances and required temporary paving) in the following locations:
 - 1) Quincy Road from potable water pipeline stationing STA 100+00 to the 42-inch, 45-degree bend approximately at STA 114+29.

- 2) East Zeering Road from potable water pipeline stationing STA 216+00 to and including the connection to the 24-inch pipeline on Quincy Road.
- b. Installation and backfill of the following facilities:
 - 1) 54-inch potable water pipeline, cathodic protection facilities, fiber optic conduit and pull boxes, and appurtenances from the tee in Quincy Road to the 54-inch wye west of the Flow Meter.
 - 2) 15-inch storm drain including manholes and appurtenances from Quincy Road to adjacent to the 54-inch wye west of the Flow Meter.
- c. Testing and disinfection are not included in this milestone.
8. By January 1, 2023, complete construction, testing and commissioning of the following facilities:
 - a. Terminal tank and all ancillary facilities (influent piping from the flanged connection point at the control valve, drain piping, tank instrumentation and controls, etc.).
 - b. Electrical room in the pump station building.
 - c. SRWA control room within the pump station, finish wiring, power, and control systems.
 - d. SCADA system.
 - e. Storm drain basin, pump station, and pipeline.
9. By March 1, 2023 the Contractor shall complete Phase 1 Commissioning of the Terminal Tank and Booster Pump Station. Phase 1 Commissioning includes startup of the terminal tank and pump station by pumping to the terminal tank. Refer to specification 01756 for all requirements.
10. The Contractor shall assume treated water that meets DDW requirements will be delivered from the SRWA WTP to the terminal tank on April 15, 2023. The Contractor shall begin Phase 2 commissioning (i.e., temporary pumping to the distribution system) as defined in specification 01756 at this time.

4.03 Delay damages:

- A. Contractor and Owner recognize that time is of the essence as stated above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. Any deduction assessed as delay damages shall not relieve the Contractor from liability for any damages or costs resulting from delays to other contractors on the project or other projects caused by a failure of the assessed Contractor to complete the work within the contract time. Due account shall be taken of any time extensions granted to the Contractor by the Owner. Permitting the Contractor to continue work beyond the contract completion date shall not operate as a waiver on the part of the Owner of any of its rights under the contract nor shall it relieve the Contractor from liability for any damages or costs resulting from delays to other contractors on the project or other projects caused by a failure of the assessed Contractor to complete the work within the contract time. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration 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 damages for delay (but not as a penalty):
 1. Potable Water Distribution System Shutdowns for Tie-ins: Contractor shall pay Owner \$1,000 for each hour the potable water system is shut down beyond the duration identified in Section 01140-1.04 for completing tie-ins to the potable water distribution system.

2. Milestones:
 - a. April 23, 2022, January 1, 2023, and March 1, 2023.
 - 1) Contractor shall pay Owner ~~\$7,500~~ \$15,000^{AD2} for each calendar day that expires after the time (as duly adjusted pursuant to the Contract) specified in this Agreement for completing the work identified in these Milestones until the work is complete.
 - b. Install construction trailers for Engineer and Construction Manager.
 - 1) Contractor shall pay Owner \$1,500 for each calendar day that expires after the time (as duly adjusted pursuant to the Contract) specified in this Agreement for installing construction trailers for Engineer and Construction Manager until the work is complete.
 - c. All other milestones:
 - 1) Contractor shall pay Owner \$250 for each calendar day that expires after the time (as duly adjusted pursuant to the Contract) specified in this Agreement until the work is complete.
3. Substantial Completion: Contractor shall pay Owner \$7,500 for each calendar day that expires after the time (as duly adjusted pursuant to the Contract) specified in this Agreement for Substantial Completion until the Work is substantially complete.
4. Completion of Remaining Work: After substantial completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner \$2,500 for each calendar day that expires after such time until the Work is completed and ready for final payment.
5. Delay damages for failing to timely attain Milestones^{AD3} Substantial Completion and final completion are not additive and will not be imposed concurrently.

4.04 Special Damages:

- A. In addition to the amount provided for liquidated damages, Contractor shall reimburse Owner for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times.

ARTICLE 5 - CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:

- A. For all Work, a lump sum of:

\$

(in words)

(figure)

1. All specific cash allowances are included in the above price and have been computed in accordance with paragraph 13.02 of the General Conditions.

- B. For all Work, at the prices stated by Contractor's Bid, Document 00410 - Bid Form is attached hereto as an exhibit.

ARTICLE 6 - PAYMENT PROCEDURES

6.01 Submittal and processing of payments:

- A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Construction Manager as provided in the General Conditions.

6.02 Progress payments; retainage:

- A. Pursuant to Section 20104.50 of California Public Contract Code, Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment within 30 days after receipt during performance of the Work as provided in paragraphs below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract:
 - 1. Pursuant to Section 22300 of California Public Contract Code, Contractor has the option to deposit securities with an Escrow Agent as a substitute for retention of earnings required to be withheld by Owner. For Escrow Agreement see Document 00602 Agreement §2230.
 - 2. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to delay damages, in accordance with the Contract:
 - a. 95 percent of Work completed (with the balance being retainage), pursuant to California Public Contract Code §7201. Release of all retention withheld shall occur within thirty-five (35) to sixty (60) days after the Notice of Completion has been recorded in compliance with the Code of Civil Procedure of the State of California.

6.03 Final Payment:

- A. Upon final completion and acceptance of the Work, in accordance with paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Construction Manager.

ARTICLE 7 - INTEREST

- 7.01 All amounts not paid when due shall bear interest at the legal rate unless otherwise specified according to California law.

ARTICLE 8 - CONTRACTOR'S REPRESENTATIONS

- 8.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

- A. Contractor has examined and carefully studied the Contract Documents and any data and reference items identified in the Bidding Documents.

- B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Contractor has carefully studied all:
 - 1. Reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
 - 2. Reports and drawings relating to Hazardous Environmental Condition, if any, at or adjacent to the Site which has been identified in the Supplementary Conditions especially with respect to Technical Data in such reports and drawings.
- E. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on:
 - 1. The cost, progress, and performance of the Work.
 - 2. The means, methods, techniques, sequences, and procedures of construction to be employed by Contractor.
 - 3. Contractor's safety precautions and programs.
- F. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
- G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- J. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception, all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

ARTICLE 9 - CONTRACT DOCUMENTS

9.01 Contents:

- A. The Contract Documents consist of the following:
 - 1. Document 00100 - Advertisement for Bids.
 - 2. Document 00200 - Instructions to Bidders.
 - 3. Document 00520 - Agreement.
 - 4. Document 00610 - Performance Bond.
 - 5. Document 00615 - Payment Bond.
 - 6. Document 00700 - General Conditions.
 - 7. Document 00800 - Supplementary Conditions.
 - 8. Specifications as listed in the table of contents of the Project Manual.
 - 9. Drawings as listed on the sheet index.
 - 10. Addenda (numbers ____ to ____, inclusive).
 - 11. Current version of City Standard Drawings and Specifications published at the time bids are due.
 - 12. Exhibits to this Agreement (enumerated as follows):
 - a. Document 00410 - Bid Form completed by the Contractor.
 - b. Document 00434 - Proposed Subcontractors Form.
 - c. Document 00436 - List of Equipment Manufacturers.
 - d. Document 00451 - Construction Contractor's Required Qualifications and Statement.
 - e. Document 00452 - Affirmative Action Program Certificate.
 - f. Document 00456 - Non-Collusion Affidavit.
 - g. Document 00458 - Certification of Drug-Free Workplace Requirements.
 - h. Document 00500 - Iran Contracting Act Certification.
 - i. Document 00506 - Public Works Contractor Registration Certification.
 - j. Document 00823 - Escrow Bid Documents.
 - k. Conformed Bid.
 - 13. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
 - a. Document 00550 - Notice to Proceed.
 - b. Executed change orders.
- B. There are no Contract Documents other than those listed in this Document.
- C. The Contract Documents may only be amended, modified, or supplemented as provided in paragraph 3.04 of the General Conditions.

ARTICLE 10 - MISCELLANEOUS

10.01 Terms:

- A. Terms used in this Agreement will have the meanings indicated in the General Conditions and the Supplementary Conditions.

10.02 Assignment of Contract:

- A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and

money that is 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.

10.03 Successors and Assigns:

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

10.04 Severability:

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 Procurement contract(s):

- A. Contractor is assigned the procurement contracts between the Owner/Buyer and the Seller for furnishing Goods and Services entitled below:
 - 1. Pump, Motor, and VFD Systems.
- B. Contractor shall offload the Goods upon delivery, supplying the labor and equipment needed for these purposes.

10.06 Contractor's Certifications:

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract:
 - 1. "Corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution.
 - 2. "Fraudulent practice" means an intentional misrepresentation of facts made:
 - a. To influence the bidding process or the execution of the Contract to the detriment of Owner.
 - b. To establish Bid or Contract prices at artificial non-competitive levels.
 - c. To deprive Owner of the benefits of free and open competition.
 - 3. "Collusive practice" means a scheme or arrangement between 2 or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels.
 - 4. "Coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

- 10.07 In accordance with Section 1775, California Labor Code, Contractor shall forfeit to Owner, as a penalty, not more than \$50 for each calendar day, or portion thereof, for each worker paid, either by Contractor or any subcontractor, less than the prevailing rates as determined by the Director of California Department of Industrial Relations for the Work.
- 10.08 In the performance of the Work, a day's work shall be 8 hours of labor in any workday and 40 hours in any work week and any other work as required by Section 510, California Labor Code, and Contractor shall further conform to the requirements of Section 1813, California Labor Code, or forfeit to Owner, as a penalty, the sum of \$25 for each worker employed in the execution of the Work by Contractor or any subcontractor, for each day during which any worker is required or permitted to labor more than 8 hours in any workday or more than 40 hours in any 1 calendar week in violation of Section 510.
- 10.09 Contractor shall carry workers' compensation insurance and require subcontractors to carry workers' compensation insurance as required by Section 3700, California Labor Code.
- 10.10 Pursuant to California Labor Code Section 6705, excavation of any trench or trenches 5 feet or more in depth, involving estimated expenditures in excess of \$25,000 shall require, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping or other provisions to be made for worker protection prepared by a registered civil or structural engineer.
- 10.11 Contractor registration:
- A. Project is subject to compliance monitoring and enforcement by the California Department of Industrial Relations (DIR).
- 10.12 Pursuant to Section 1770 et seq., California Labor Code, the successful Bidder shall pay not less than the prevailing rate of per diem wages as determined by the Director of California Department of Industrial Relations. A copy of such prevailing rate is on file at the offices of the City of Turlock, California which copy will be made available for examination during business hours to any party on request.
- 10.13 Contractor, by signing this Agreement, certifies the following: "I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work of this Contract."
- 10.14 Nothing in this Agreement shall prevent Contractor or any Subcontractor from employing properly registered apprentices in the execution of the Agreement. Contractor shall have responsibility for compliance with California Labor Code Section 1777.5 for all apprenticeable occupations.
- 10.15 Other Provisions:
- A. Owner stipulates that if the General Conditions that are made a part of this Contract are based on EJCDC® C-700, Standard General Conditions for the Construction Contract, published by the Engineers Joint Contract Documents Committee®, and if Owner is the party that has furnished said General Conditions, then Owner has

plainly shown all modifications to the standard wording of such published document to the Contractor, in the Supplementary Conditions.

10.16 Other Contracts:

- A. Owner may award other contracts for additional work, and Contractor shall fully cooperate with such other Contractors and carefully fit Contractor's own work to that provided under other contracts as may be directed by the City Engineer. Contractor shall not commit or permit any act which will interfere with the performance of work by any other Contractor.

10.17 Provisions Cumulative:

- A. The provisions of this agreement are cumulative, and in addition to and not in limitation of, any other rights or remedies available to City.

10.18 Notices:

- A. All notices shall be in writing and delivered in person or transmitted by certified mail, postage prepaid.

Notices required to be given to Owner shall be addressed as follows:

City of Turlock
City Engineer
156 S. Broadway, Suite 150
Turlock, CA 95380-5461

Notices required to be given to Contractor shall be addressed as follows:

Notices required to be given to sureties of Contractor shall be addressed as follows:

10.19 Owner Contract Administrator:

- A. The Owner's contract administrator and contact person for this Agreement is:

Stephen Fremming
City of Turlock Engineering Division
156 S. Broadway, Suite 150
Turlock, California 95380
Telephone: (209) 668-5417
E-mail: sfremming@turlock.ca.us

10.20 Use of Owner Project Number

- A. The Contractor or subcontractor agrees to use the aforementioned Owner project number on all maps, drawings, submittals, billing, and written correspondence that involve Owner staff or contracted consultants. Nothing in this section shall preclude the Contractor or subcontractor from using their own project numbers for their own internal use.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement in duplicate. One counterpart each has been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or identified by Owner and Contractor or on their behalf.

This Agreement will be effective on _____, 20____ (which is the Effective Date of the Agreement).

CONTRACTOR:

OWNER:

CITY OF TURLOCK, a municipal corporation

By: _____

By: _____
Sarah Eddy, Interim City Manager

Print Name

Date: _____

Address: _____

APPROVED AS TO SUFFICIENCY:

By: _____
Nathan Bray, Development Services
Director / City Engineer

Phone: _____

APPROVED AS TO FORM:

Date: _____

By: _____
George A. Petrulakis, Interim City
Attorney

Federal Tax ID or Social Security No.

ATTEST:

By: _____
Jennifer Land, City Clerk

(Attach Contractor Seal Here)

END OF DOCUMENT

AD2 Addendum No. 2

AD3 Addendum No. 3

DOCUMENT 00800

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement Document 00700 - General Conditions. All provisions, which are not so amended or supplemented, remain in full force and effect.

The terms used in these Supplementary Conditions will have the meanings indicated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings indicated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

SC-1.01 Defined Terms

SC-1.01 Add to the list of definitions in Paragraph 1.01.A by inserting the following as numbered items in their proper alphabetical positions:

Construction Manager - Person or entity designated by the Owner to provide construction management services for the Project.

Design Engineer - Carollo Engineers, Inc.

Final Completion - The Work is complete when it is ready for final payment as established by the Engineer's written recommendation of final payment as set forth in Paragraph 15.06.

ARTICLE 2 - PRELIMINARY MATTERS

SC-2.01 Delivery of Bonds and Evidence of Insurance

SC-2.01 Delete Paragraphs 2.01 B. and C. in their entirety and insert the following in their place:

B. Evidence of Contractor's Insurance: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner copies of the policies of insurance (including all endorsements, and identification of applicable self-insured retentions and deductibles) required to be provided by Contractor in Article 6. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

C. Evidence of Owner's Insurance: After receipt from Contractor of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor copies of the policies of insurance to be provided by Owner under Article 6 (if any). Owner may block out (redact) any confidential premium or pricing

information contained in any policy or endorsement furnished under this provision.

SC-2.02 Copies of Documents

SC-2.02 Delete Paragraph 2.02.A. in its entirety and insert the following in its place:

- A. Owner shall furnish Contractor up to 5 printed copies of the Contract Conformed Documents (including 1 fully executed counterpart of the Agreement), and 1 copy in electronic portable document format (PDF). Additional printed copies may be made by the Contractor at the Contractor's expense.

SC-2.03 Before Starting Construction

SC-2.03 Replace Engineer with Construction Manager in paragraph 2.03A.

SC-2.04 Preconstruction Conference; Designation of Authorized Representative

SC-2.04 Delete Paragraph 2.04.A in its entirety and insert the following in its place:

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, Construction Manager, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

SC-2.04 Delete Paragraph 2.04.B. in its entirety.

SC-2.05 Initial Acceptance of Schedules

SC-2.05 Delete Paragraph 2.05A in its entirety and insert the following in its place:

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, Construction Manager, and others as appropriate, will be held to review for acceptability to Construction Manager as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Construction Manager.

- SC-2.05 In both the first and second sentence of paragraph 2.05.A.1, replace Engineer with Construction Manager.
- SC-2.05 In paragraph 2.05.A.2, replace Engineer with Construction Manager.
- SC-2.05 In paragraph 2.05.A.3, replace Engineer with Construction Manager.
- SC-2.06 Electronic Transmittals
- SC-2.06 Replace the first sentence of paragraph 2.06.A with the following:
- "Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, Construction Manager, and Contractor may transmit, and shall accept, Project-related correspondence..."
- SC-2.06 Delete Paragraph 2.06.B. in its entirety and insert the following in its place:
- A. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, Construction Manager, and Contractor shall jointly develop such protocols.

ARTICLE 3 - DOCUMENTS: INTENT, REQUIREMENTS, REUSE

- SC-3.02 Reference Standards
- SC-3.02 Delete Paragraph 3.02.A.2. in its entirety and insert the following in its place:
- A. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, Construction Manager, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, Construction Manager, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

ARTICLE 4 - COMMENCEMENT AND PROGRESS OF THE WORK

- SC-4.01 Commencement of Contract Times; Notice to Proceed
- SC-4.01 Delete Paragraph 4.01.A. in its entirety and insert the following in its place:
- A. The time fixed for the commencement of such work is within (10) working days after the "Notice to Proceed" has been issued.
- SC-4.04 Progress Schedule
- SC-4.04 In Paragraph 4.04.A.1. replace Engineer with Construction Manager.
- SC-4.05 Delays in Contractor's Progress

SC-4.05 Replace the first sentence of Paragraph 4.05.A. with the following:

"If Owner, Engineer, Construction Manager, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance....."

ARTICLE 5 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

SC-5.01 Availability of Lands

SC-5.01 Delete paragraph 5.01.C in its entirety and insert the following in its place:

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment. Contractor shall provide a letter signed by each property owner who has consented to allow Contractor's use of property to Owner at the end of the project stating that the Contractor has restored the property to an acceptable state and shall be submitted prior to the work considered to be complete and ready for final payment per Paragraph 15.06 of the General Conditions.

SC-5.01 Add the following new paragraph immediately after Paragraph 5.01.C:

D. Any Work performed in public rights-of-way or within public agency granted easements, in addition to conforming to the Contract Documents, shall be done in accordance with the requirements of the permit issued by the public agency in whose right-of-way the Work is located.

SC-5.02 Use of Site and Other Areas

SC-5.02 Delete Paragraph 5.02.A.2. in its entirety and insert the following in its place:

A. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner, Engineer, and Construction Manager and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, and Construction Manager, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

SC-5.03 Subsurface and Physical Conditions

SC-5.03 Replace the final sentence in paragraph 5.03.B. with the following:

Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner, Engineer, or Construction Manager or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.B:

C. The following reports of explorations and tests of subsurface conditions at or adjacent to the Site are known to Owner:

1. Final Geotechnical Report, Turlock Water Distribution System Project, Prepared by Crawford & Associates, Inc, May 2021.

D. The following drawings of physical conditions relating to existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities) are known to Owner:

1. All available As-Built drawings are included in the Appendices.

E. Copies of reports and drawings identified in Document 00800 Supplementary Conditions that were not included with the Bidding Documents will be posted on the City's bidding website. Contractors may request copies of PDF documents by requesting them from Stephen Fremming, phone 209-668-5417, sfremming@turlock.ca.us.

SC-5.04 Differing Subsurface or Physical Conditions

SC-5.04 In the paragraph following 5.04.A.4., replace the first sentence with the following:

"then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner, Engineer, and Construction Manager in writing about such condition..."

SC-5.04 In Paragraph 5.04.C., replace the first sentence with the following:

"Owner's Statement to Contractor Regarding Site Condition: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer and Construction Manager) regarding the subsurface or physical condition in question..."

SC-5.05 Underground Facilities

SC-5.05 Replace Paragraph 5.05.A.1. in its entirety and insert the following:

1. Owner, Engineer, and Construction Manager do not warrant or guarantee the accuracy or completeness of any such information or data provided by others: and

- SC-5.05 Replace the final sentence of Paragraph 5.05.B. with the following:
"...identify the owner of such Underground Facility and given written notice to that owner and to Owner, Engineer, and Construction Manager."
- SC-5.05 Replace the first sentence of Paragraph 5.05.D. with the following:
" *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer and Construction Manager) regarding the Underground Facility....."
- SC-5.06 Hazardous Environmental Conditions at Site
- SC-5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:
- A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner. Groundwater Quality data is included in Volume 4.
- B. Not Used.
- SC-5.06 Delete Paragraph 5.06.E. in its and insert the following in its place:
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner, Engineer, and Construction Manager (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- SC-5.06 Replace the first sentence in Paragraph 5.06.I. with the following:
"To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, Engineer, Construction Manager, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors...."

SC-5.06 Replace the first sentence in Paragraph 5.06J with the following:

" To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner, Engineer, and Construction Manager, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors...."

ARTICLE 6 - BONDS AND INSURANCE

SC-6.01 Performance, Payment, and Other Bonds

SC-6.01 Delete Paragraph 6.01.D. in its entirety and insert the following in its place:

D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner, Engineer, and Construction Manager, and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.

SC-6.03 Contractor's Insurance

SC-6.03 Replace the first sentence in paragraph 6.03.G. with the following:

"Additional insureds: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner, Engineer, and Construction Manager and any individuals or entities identified in the Supplementary Conditions...."

SC-6.03 Replace the final sentence in Paragraph 6.03.I.3. with the following:

Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, Construction Manager, and each other insured under the policy.

Add the following new paragraph immediately after Paragraph 6.03.J:

- K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions:

State:	<u>Statutory</u>
Federal, if applicable (e.g., Longshoreman's):	<u>Statutory</u>
Employer's Liability:	
Bodily injury, each accident	\$ <u>1,000,000</u>
Bodily injury aggregate	\$ <u>2,000,000</u>
Foreign voluntary worker compensation	<u>Statutory</u>

Contractor shall submit to City, along with the certificate of insurance, a Waiver of Subrogation endorsement in favor of the City, its officers, agents, employees, and volunteers.

2. Contractor's Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:

General Aggregate	\$ <u>5,000,000</u>
Products - Completed Operations Aggregate	\$ <u>2,000,000</u>
Personal and Advertising Injury	\$ <u>2,000,000</u>
Each Occurrence (Bodily Injury and Property Damage)	\$ <u>2,000,000</u>

Contractor shall maintain commercial general liability insurance with coverage at least as broad as Insurance Services Office form CG 00 01. Contractor's general liability policies shall be primary and non-contributory, and be endorsed using Insurance Services Office form CG 20 10 to provide that City and its officers, officials, employees, and agents shall be additional insureds under such policies. For construction contracts, an endorsement providing completed operations to the additional insured, ISO form CG 20 37, is also required.

3. Automobile Liability under Paragraph 6.03.D. of the General Conditions:

Bodily Injury:

Each person	\$	<u>2,000,000</u>
Each accident	\$	<u>2,000,000</u>

Property Damage:

Combined Single Limit of	\$	<u>2,000,000</u>
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Contractor shall provide auto liability coverage for owned, non-owned, and hired autos using ISO Business Auto Coverage form CA 00 01, or the exact equivalent. If Contractor owns no vehicles, this requirement may be met through a non-owned auto endorsement to the CGL policy.

4. Excess or Umbrella Liability:

Per Occurrence	\$	<u>5,000,000</u>
General Aggregate	\$	<u>5,000,000</u>

5. Contractor's Pollution Liability:

Each Occurrence	\$	<u>1,000,000</u>
General Aggregate	\$	<u>2,000,000</u>

☐ If box is checked, Contractor is not required to provide Contractor's Pollution Liability insurance under this Contract

Pollution Coverage shall be provided on a Contractors Pollution Liability form or other form acceptable to City providing coverage for liability arising out of sudden, accidental and gradual pollution and remediation. All activities contemplated shall be specifically scheduled on the policy as "covered operations." The policy shall provide coverage for the hauling of waste from the project site to the final disposal location, including non-owned disposal sites.

6. Contractor's Professional Liability:

Each Claim	\$	<u>1,000,000</u>
Annual Aggregate	\$	<u>1,000,000</u>

When applicable, Contractor shall maintain professional liability insurance that insures against professional errors and omissions that may be made in performing the Services to be rendered in connection with this Agreement. Any policy inception date, continuity date, or retroactive date must be before the effective date of this Agreement, and Contractor agrees to maintain continuous coverage through a period no less than three (3) years after completion of the services required by this Agreement.

7. Additional Insureds: In addition to Owner include as additional insureds the following: Engineer; Construction Manager; and Stanislaus County, its officers, agents, employees, and servants.

L. Each policy shall contain a cross liability or severability of interest clause or endorsement. Insurance covering the specified additional insureds shall be primary insurance, and all other insurance carried by the additional insureds shall be excess insurance; and with respect to workers' compensation and employer's liability, comprehensive automobile liability, commercial general liability, and umbrella liability insurance, Contractor shall require Contractor's insurance carriers to waive all rights of subrogation against Owner, Engineer, Design Engineer and Construction Manager and their respective officers, directors, partners, employees, subconsultants, and agents.

SC-6.04 Owner's Liability Insurance

SC-6.04 Delete Paragraph 6.04.B. in its entirety and insert the following in its place:

- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, Construction Manager, or third parties.

SC-6.05 Property Insurance

SC-6.05 Add the following new subparagraph after subparagraph 6.05.A.1:

- a. In addition to Owner, Contractor, and all Subcontractors, include as insureds the following: Engineer; Construction Manager; and Stanislaus County, its officers, agents, employees, and servants.

SC-6.05 Amend the first sentence of Paragraph 6.05.B to read as follows:

All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to the purchasing policyholder.

SC-6.06 *Waiver of Rights*

SC-6.06 Delete Paragraph 6.06.A. in its entirety and insert the following in its place:

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or Construction Manager or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer or Construction

Manager, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

SC-6.06 Delete only Paragraph 6.06.B (subparagraphs remain) and replace with the following:

- B. Owner waives all rights against Contractor, Subcontractors, Engineer, and Construction Manager, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for:

SC-6.06 Replace the final portion of paragraph 6.06.C. with the following:

"...against Contractor, Subcontractors, Engineer, Construction Manager, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them."

SC-6.06 Delete Paragraph 6.06.D. in its entirety and insert the following in its place:

- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and Construction Manager, and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

SC-7.01 Supervision and Superintendence

SC-7.01 Delete Paragraph 7.01.B. in its entirety and insert the following in its place:

- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner, Engineer, and Construction Manager except under extraordinary circumstances.

SC-7.02 Labor; Working Hours

SC-7.02 Add the following new subparagraphs immediately after Paragraph 7.02.B:

1. Regular working hours will be 7:00 a.m. to 5:00 p.m.

2. Owner's legal holidays are New Year's Day, Martin Luther King, Jr. Day, President's Birthday, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving/Day After Thanksgiving, Christmas Day.

SC-7.06 Concerning Subcontractors, Suppliers, and Others

SC-7.06 Add the following subparagraph immediately after 7.06.B:

1. Subcontracting: Contractor shall perform with Contractor's own organization work amounting to not less than 50 percent of the combined value of all items of the Work covered by the Contract.

SC-7.06 Delete Paragraph 7.06.I. in its entirety and insert the following in its place:

- I. Contractor shall be fully responsible to Owner, Engineer, and Construction Manager for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.

SC-7.06 Delete Paragraph 7.06.K. in its entirety and insert the following in its place:

- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer, Owner, or Construction Manager except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.

SC-7.06 Delete Paragraph 7.06.M. in its entirety and insert the following in its place:

- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner, Engineer, and Construction Manager.

SC-7.06 Delete Paragraphs 7.06.O.1. and 7.06.O.2. in their entirety and insert the following in their place:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner, Engineer, or Construction Manager, and any such Subcontractor, Supplier, or other individual or entity; nor
2. shall create any obligation on the part of Owner, Engineer, or Construction Manager to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

SC-7.07 Patent Fees and Royalties

SC-7.07 Delete the second sentence in Paragraph 7.07.A. and replace with the following

If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner, Engineer, or Construction Manager, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

SC-7.07 Replace the first sentence of Paragraph 7.07.C. with the following:

- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner, Engineer, and Construction Manager, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors.

SC-7.09 Taxes

SC-7.09 Add the following new sentence and subparagraphs immediately after the last sentence of paragraph 7.09.A:

Contractor shall cooperate with City to the full extent possible to maximize the local allocation of California sales and use tax to the City. Such cooperation shall include but not be limited to:

1. Use Tax Direct Payment Permits. Contractor shall apply for, obtain and utilize, to the maximum extent reasonable, a California Use Tax Direct Payment Permit.
2. Purchases of \$500,000 or More. Contractor shall require vendors and suppliers located outside California from whom Contractor makes purchase of \$500,000 or more to allocate the use tax to the City.

Additional information regarding use tax and the Permit can be found in the State of California Board of Equalization, Sales and Use Tax Regulations, Regulation 1699.6, Use Tax Direct Payment Permits, or on the web site for the Board of Equalization at <http://www.boe.ca.gov/sutax/sutprograms.htm>

SC-7.10 Replace Paragraph 7.10.A. in its entirety and insert the following in its place:

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer nor Construction Manager shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

SC-7.10 Replace Paragraph 7.10.B. in its entirety and insert the following in its place:

- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner, Engineer, and Construction Manager, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

SC-7.12 Safety and Protection

SC-7.12 Insert the following new sentence immediately after the second sentence of Paragraph 7.12.C:

The following Owner safety programs are applicable to the Work: Contractor's Safety Program.

SC-7.12 Delete Paragraph 7.12.D. in its entirety and insert the following in its place:

D. Contractor shall inform Owner, Engineer, and Construction Manager of the specific requirements of Contractor's safety program with which Owner's, Engineer's, and Construction Manager's employees and representatives must comply while at the Site.

SC-7.12 Delete Paragraph 7.12.E. in its entirety and insert the following in its place:

E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner, Engineer, or Construction Manager or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

SC-7.14 Hazard Communication Programs:

SC-7.14.B Add the following paragraphs immediately after 6.15.A:

- B. Contractor shall promptly, and before the following conditions are disturbed, notify Owner and Engineer, in writing, of any:
 - 1. Material that Contractor believes may be material that is hazardous waste, as defined in Section 25117, California 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.
 - 2. Subsurface or latent physical conditions at the site differing from those indicated in the Contract Documents.
 - 3. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents.
- C. Owner will promptly investigate the conditions, and where Owner finds the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Contract Price, or in the Contract Time, or both, a Change Order will be issued in accordance with Document 00700, General Conditions.
- D. In the event a dispute arises as to whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contract Price, Contract Time, or both, Contractor shall not be excused from any scheduled completion date provided in the Contract Documents, but shall proceed with the Work.

SC-7.15 *Emergencies*

SC-7.15 Delete Paragraph 7.15.A. in its entirety and insert the following in its place:

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer and Construction Manager prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

SC-7.16 Shop Drawings, Samples, and Other Submittals

SC-7.16 Delete the first sentence in Paragraph 7.16.D.1. and replace with the following:

Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer and Construction Manager.

SC-7.16 Delete the Paragraph 7.16.E.2 in its entirety and insert the following in its place:

2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than two submittals. Engineer will record Engineer's time for reviewing a third or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

SC-7.20 Add the following paragraph immediately after Article 7.19

SC-7.18 Indemnification

SC-7.18 Replace the beginning of Paragraph 7.18.A. with the following:

"To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner, Engineer, and Construction Manager, and the officers, directors, members, partners, employees, agents, consultants and subcontractors....."

Add to the end of Paragraph 7.18.A. with the following:

" Contractor shall not be obligated to defend or indemnify City for City's own negligence or for the negligence of others."^{AD3}

SC-7.18 Replace the beginning of Paragraph 7.18.B. with the following:

"In any and all claims against Owner or Engineer or Construction Manager or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee....."

SC-7.19 Delegation of Professional Design Services

- SC-7.19 Replace the first sentence of Paragraph 7.19.B. with the following:
If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner, Engineer, and Construction Manager will specify all performance and design criteria that such services must satisfy.
- SC-7.19 Replace Paragraph 7.19.C. in its entirety and insert the following in its place:
Owner, Engineer, and Construction Manager shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner, Engineer, and Construction Manager have specified to Contractor all performance and design criteria that such services must satisfy.
- SC-7.19 Replace Paragraph 7.19.E. in its entirety and insert the following in its place:
Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner, Engineer, or Construction Manager.
- SC-7.20 City Business License
- SC-7.20 Add the following paragraphs immediately after Article 7.19 and insert the following in its place:
- E. A Stanislaus County business license is not required for this project.
 - F. Contractor shall obtain a City of Turlock business license prior to issuance of the Notice to Proceed. The cost of the business license is a up-front fee of eighty four dollars (\$84) plus fifty cents per thousand dollars in revenue received for work performed on the project, made payable on a semi-annual basis. Business Licenses are obtained through the Finance Division at Turlock City Hall, 156 S. Broadway, Suite 114. Additional information can be found on the City's website at <http://ci.turlock.ca.us/doingbusinessinturlock/businesslicenses/newbusinesslicense.asp>.
 - G. Full compensation for obtaining business licenses as specified above shall be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed therefore.

ARTICLE 8 - OTHER WORK AT THE SITE

SC-8.03 *Legal Relationships*

- SC-8.03 Replace Paragraph 8.03.D. in its entirety and insert the following in its place:
- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, Engineer, or Construction Manager then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by

arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner, Engineer, and Construction Manager, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 - OWNER'S RESPONSIBILITIES

SC-9.01 Communications to Contractor

SC-9.01 Amend the first sentence of paragraph 9.01.A to read as follows:

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Construction Manager.

SC-9.01 Add paragraph 9.01.B to read as follows:

- B. Construction Manager will establish and implement procedures including testing, reviewing and processing requests for clarifications and interpretations of the Contract Documents; Shop Drawings, samples, and other submittals; schedule adjustments; Change Order proposals; written proposals for substitutions; payment applications; and maintenance of logs.

SC-9.02 Replacement of Engineer

SC-9.02 Amend the first sentence of paragraph 9.02.A to read as follows:

Owner may at its discretion appoint an engineer to replace Engineer.

ARTICLE 10 - ENGINEER'S STATUS DURING CONSTRUCTION

SC-10.01 Owner's Representative

SC-10.01 In Paragraph 10.01.A. replace Engineer with Construction Manager at each location it appears.

SC-10.02 Visits to Site

SC-10.02 In Paragraphs 10.02.A. and 10.02.B. replace Engineer with Construction Manager at each location it appears.

SC-10.03 Project Representative

SC-10.03 Delete Paragraph 10.03 in its entirety.

SC-10.05 Shop Drawings, Change Orders and Payments

SC-10.05 Delete Paragraph 10.05.D. in its entirety and insert the following in its place:

- D. Construction Manager's authority as to Applications for Payment is set forth in Article 15.

SC-10.08 Limitations on Engineer's Authority and Responsibilities

SC-10.08 Change the title of SC-10.08 to Limitations on Engineer's and Construction Manager's Authority and Responsibilities

SC-10.08 Delete Paragraph 10.08.A. in its entirety and insert the following in its place:

- A. Neither Engineer's nor Construction Manager's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer or Construction Manager in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer or Construction Manager, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer or Construction Manager to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

SC-10.08 Delete Paragraph 10.08.B. in its entirety and insert the following in its place:

- B. Engineer and Construction Manager will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer and Construction Manager will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

SC-10.08 Delete Paragraph 10.08.C. in its entirety and insert the following in its place:

- C. Engineer and Construction Manager will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

SC-10.08 Delete Paragraph 10.08.D. in its entirety and insert the following in its place:

- D. Engineer's and Construction Manager's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

SC-10.09 Compliance with Safety Program

SC-10.09 Delete Paragraph 10.09.A. in its entirety and insert the following in its place:

- A. While at the Site, Engineer's and Construction Manager's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer and Construction Manager has been informed.

ARTICLE 11 - AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

SC-11.01 Amending and Supplementing Contract Documents

SC-11.01 Insert the following subparagraphs immediately following 11.02.A.1.b:

- c. In signing a Change Order, the Owner and Contractor acknowledge and agree that:
 - 1) the stipulated compensation (Contract Price or Contract Times, or both) set forth in the Change Order includes not only all direct costs of Contractor such as labor, material, job overhead, and profit markup, but also includes any costs for modifications or changes in sequence of work to be performed, delays, rescheduling, disruptions, extended direct overhead or general overhead, acceleration, material or other escalation which includes wages and other impact costs. This document will become a supplement to the Contract and all Contract provisions will apply hereto. It is understood that this Change Order shall be effective on the date approved by the Owner's Representative.
 - 2) the Change Order constitutes full mutual accord and satisfaction for the change to the Work;
 - 3) no reservation of rights to pursue subsequent claims on the Change Order will be made by either party; and
 - 4) no subsequent claim or amendment of the Contract Documents will arise out of or as a result of the Change Order.

SC-11.04 Change of Contract Price

SC-11.04 Delete the Paragraph 11.04.B.3 in its entirety and insert the following in its place:

- 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor markup percentage for overhead and profit as provided below:
 - a. Labor markup: Labor markup applies to the direct performance of the work and equals 5 percent. In addition to the 5 percent markup, Contractor shall receive the labor surcharge percentage published in the current edition of the Caltrans Labor Surcharge and Equipment Rental Rates book.
 - b. Materials markup: Material markup applies to materials furnished and consumed on the extra work and equals 5 percent of the direct cost to the Contractor.

- c. Equipment markup: Equipment markup is applied to all equipment utilized on the extra work and equals 5 percent.
- d. Subcontractor markup: If a subcontractor performs work on the basis of the Cost of the Work, accept an additional 2 percent markup to the total cost of that work paid at the basis of the Cost of the Work, including markups specified above, as reimbursement for additional administrative costs.

SC-11.05 Change of Contract Times

SC-11.05 Add the following new paragraphs immediately after 11.05.B:

C. Use of Float:

- 1. A request for adjustment of Contract Times (or Milestones), otherwise allowable under the Contract Documents, shall be granted only when the time lost or gained exceeds the float for the activity at the time of the event giving rise to the claim. Float, the amount of time between the early start date and the late start date, or the early finish date and the late finish date, is jointly owned by both Owner and Contractor whether expressly disclosed or implied in any manner.
- 2. Contractor shall not use float suppression techniques (including, but not limited to, preferential sequencing caused by late starts of follow-up trades, unreasonably small crews, extended durations, or imposed dates) in information provided to Engineer.

D. Weather Days:

- 1. The Contract Time includes a weather day allowance of 25 working days. No extension in Contract Time will be allowed for the first 25 working days lost due to weather conditions.

SC-11.06 Change Proposals

SC-11.06 Delete Paragraph 11.06.a.1 in its entirety and insert the following in its place:

- 1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 15 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.

ARTICLE 12 - CLAIMS

SC-12.01 Delete Paragraph 12.01 in its entirety and insert the following in its place:

12.01. Claims Process:

Claims between the Owner and Contractor shall be addressed as provided by California Public Contract Code Section 9204, which is set forth in its entirety:

Legislative findings and declarations regarding timely and complete payment of contractors for public works projects; claims process.

(a) The Legislature finds and declares that it is in the best interests of the state and its citizens to ensure that all construction business performed on a public works project in the state that is complete and not in dispute is paid in full and in a timely manner.

(b) Notwithstanding any other law, including, but not limited to, Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2, Chapter 10 (commencing with Section 19100) of Part 2, and Article 1.5 (commencing with Section 20104) of Chapter 1 of Part 3, this section shall apply to any claim by a contractor in connection with a public works project.

(c) For purposes of this section:

(1) "Claim" means a separate demand by a contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:

(A) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by a public entity under a contract for a public works project.

(B) Payment by the public entity of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public works project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled.

(C) Payment of an amount that is disputed by the public entity.

(2) "Contractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who has entered into a direct contract with a public entity for a public works project.

(3) Public entity definition

(A) "Public entity" means, without limitation, except as provided in subparagraph (B), a state agency, department, office, division, bureau, board, or commission, the California State University, the University of California, a city, including a charter city, county, including a charter county, city and county, including a charter city and county, district, special district, public authority, political subdivision, public corporation, or nonprofit transit corporation wholly owned by a public agency and formed to carry out the purposes of the public agency.

(B) "Public entity" shall not include the following:

(i) The Department of Water Resources as to any project under the jurisdiction of that department.

(ii) The Department of Transportation as to any project under the jurisdiction of that department.

(iii) The Department of Parks and Recreation as to any project under the jurisdiction of that department.

(iv) The Department of Corrections and Rehabilitation with respect to any project under its jurisdiction pursuant to Chapter 11 (commencing with Section 7000) of Title 7 of Part 3 of the Penal Code.

(v) The Military Department as to any project under the jurisdiction of that department.

(vi) The Department of General Services as to all other projects.

(vii) The High-Speed Rail Authority.

(4) "Public works project" means the erection, construction, alteration, repair, or improvement of any public structure, building, road, or other public improvement of any kind.

(5) "Subcontractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who either is in direct contract with a contractor or is a lower tier subcontractor.

(d) Claims process:

(1) Claims review and response

(A) Upon receipt of a claim pursuant to this section, the public entity to which the claim applies shall conduct a reasonable review of the claim and, within a period not to exceed 45 days, shall provide the claimant a written statement identifying what portion of the claim is disputed and what portion is undisputed. Upon receipt of a claim, a public entity and a contractor may, by mutual agreement, extend the time period provided in this subdivision.

(B) The claimant shall furnish reasonable documentation to support the claim.

(C) If the public entity needs approval from its governing body to provide the claimant a written statement identifying the disputed portion and the undisputed portion of the claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a claim sent by registered mail or certified mail, return receipt requested, the public entity shall have up to three days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension, expires to provide the claimant a written statement identifying the disputed portion and the undisputed portion.

(D) Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. If the public entity fails to issue a written statement, paragraph (3) shall apply.

(2) Claims dispute

(A) If the claimant disputes the public entity's written response, or if the public entity fails to respond to a claim issued pursuant to this section within the time prescribed, the claimant may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return

receipt requested, the public entity shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(B) Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the public entity shall provide the claimant a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. Any disputed portion of the claim, as identified by the contractor in writing, shall be submitted to nonbinding mediation, with the public entity and the claimant sharing the associated costs equally. The public entity and claimant shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside this section.

(C) For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.

(D) Unless otherwise agreed to by the public entity and the contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.

(E) This section does not preclude a public entity from requiring arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program, if mediation under this section does not resolve the parties' dispute.

(3) Failure by the public entity to respond to a claim from a contractor within the time periods described in this subdivision or to otherwise meet the time requirements of this section shall result in the claim being deemed rejected in its entirety. A claim that is denied by reason of the public entity's failure to have responded to a claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of the claimant.

(4) Amounts not paid in a timely manner as required by this section shall bear interest at 7 percent per annum.

(5) If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a public entity because privity of contract does not exist, the contractor may present to the public entity a claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that the contractor present a claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the claim be presented to the public entity shall furnish reasonable documentation to support the claim. Within 45 days of receipt of this written request, the contractor shall notify the subcontractor in writing as to whether the contractor presented the claim to the public entity and,

if the original contractor did not present the claim, provide the subcontractor with a statement of the reasons for not having done so.

(e) The text of this section or a summary of it shall be set forth in the plans or specifications for any public works project that may give rise to a claim under this section.

(f) A waiver of the rights granted by this section is void and contrary to public policy, provided, however, that (1) upon receipt of a claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable; and (2) a public entity may prescribe reasonable change order, claim, and dispute resolution procedures and requirements in addition to the provisions of this section, so long as the contractual provisions do not conflict with or otherwise impair the timeframes and procedures set forth in this section.

(g) This section applies to contracts entered into on or after January 1, 2017.

(h) Nothing in this section shall impose liability upon a public entity that makes loans or grants available through a competitive application process, for the failure of an awardee to meet its contractual obligations.

(i) This section shall remain in effect only until January 1, 2020, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2020, deletes or extends that date.

(j) Claims Process additional requirements:

(1) Claims asserted by the Owner against the Contractor shall be submitted according to the procedures set forth above.

(2) In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled. Such a claim shall be submitted promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal.

(3) The party submitting the Claim shall also furnish a copy to the Engineer and Construction Manager, for its information only. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer and Construction Manager.

(4) Mediation:

(A) If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision.

SC-12.01 Add the following subparagraph immediately following Paragraph 12.01.A:

- B. Claims over \$375,000 or less shall be resolved pursuant to California Public Contract Code Section 20104 et seq. unless Owner elects to resolve the dispute pursuant to California Public Contract Code Section 10240 et seq.

ARTICLE 13 - COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

SC-13.01 Cost of Work

SC-13.01 Delete Paragraph 13.01.B.3. in its entirety and insert the following in its place:

- 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer or Construction Manager, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01

SC-13.01 Delete Paragraph 13.01.B.5.c in its entirety and insert the following in its place:

c. Construction Equipment and Machinery

Equipment rental payment is full compensation for:

- 1. Rental equipment costs, including moving rental equipment to and from the change order work site using its own power.
- 2. Transport equipment costs for rental equipment that cannot be transported economically using its own power. No payment is made during transport for the transported equipment.

If the Contractor wants to return the equipment to a location other than its original location, the payment to move the equipment must not exceed the cost of returning the equipment to its original location. If the Contractor uses the equipment for work other than work paid by force account, the transportation cost is included in the other work.

Before moving or loading the equipment, obtain authorization for the equipment rental's original location.

The Engineer determines rental costs:

- 1. Using rates in the Caltrans Labor Surcharge and Equipment Rental Rates:
 - 1.1. By classifying equipment using manufacturer's ratings and manufacturer-approved changes.
 - 1.2. Current during the work paid by force account.

- 1.3. Regardless of equipment ownership; but the City uses the rental document rates or minimum rental cost terms if:
 - 1.3.1. Rented from equipment business the Contractor does not own.
 - 1.3.2. The Labor Surcharge and Equipment Rental Rates hourly rate is \$10.00 per hour or less.
2. Using rates established by the Engineer for equipment not listed in Labor Surcharge and Equipment Rental Rates. The Contractor may submit cost information that helps the Engineer establish the rental rate; but the City uses the rental document rates or minimum rental cost terms if:
 - 2.1. Rented from equipment business the Contractor does not own.
 - 2.2. The Engineer establishes a rate of \$10.00 per hour or less.
3. Using rates for transport equipment not exceeding the hourly rates charged by established haulers.

Equipment rental rates include the cost of:

 1. Fuel.
 2. Oil.
 3. Lubrication.
 4. Supplies.
 5. Small tools that are not consumed by use.
 6. Necessary attachments.
 7. Repairs and maintenance.
 8. Depreciation.
 9. Storage.
 10. Insurance.
 11. Incidentals.

The City pays for small tools consumed by use. The Engineer determines payment for small tools consumed by use based on Contractor-submitted invoices.

The Engineer may authorize rates in excess of those in the Labor Surcharge and Equipment Rental Rates if:

1. The Contractor submits a request to use rented equipment.
2. Equipment is not available from the Contractors normal sources or from one of the Contractors subcontractors.
3. Rented equipment is from an independent rental company.
4. Proposed equipment rental rate is reasonable.
5. The Engineer authorizes the equipment source and the rental rate before the Contractor uses the equipment.

EQUIPMENT ON THE JOB SITE

For equipment on the job site at the time required to perform work paid by force account, the time paid is the time:

1. To move the equipment to the location of work paid by force account plus an equal amount of time to move the equipment to another location on the job site when the work paid by force account is completed.
2. To load and unload equipment.
3. Equipment is operated to perform work paid by force account and:
 - 3.1. Hourly rates are paid in 1/2-hour increments.
 - 3.2. Daily rates are paid in 1/2-day increments.

EQUIPMENT NOT ON THE JOB SITE REQUIRED FOR ORIGINAL CONTRACT WORK

For equipment not on the job site at the time required to perform work paid by force account and required for original-Contract work, the time paid is the time the equipment is operated to perform work paid by force account and the time to move the equipment to a location on the job site when the work paid by force account is completed.

The minimum total time paid is:

1. 1 day if daily rates are paid.
2. 8 hours if hourly rates are paid.

If daily rates are recorded, equipment:

1. Idled is paid as 1/2 day.
2. Operated 4 hours or less is paid as 1/2 day.
3. Operated 4 hours or more is paid as 1 day.

If the minimum total time exceeds 8 hours and if hourly rates are listed, the City rounds up hours operated to the nearest 1/2-hour increment and pays based on the hours shown the following table. The table does not apply when equipment is not operated due to breakdowns, in which case rental hours are the hours the equipment was operated.

Equipment Rental Hours

Hours operated	Hours paid
0.0	4.00
0.5	4.25
1.0	4.50
1.5	4.75
2.0	5.00
2.5	5.25

3.0	5.50
3.5	5.75
4.0	6.00
4.5	6.25
5.0	6.50
5.5	6.75
6.0	7.00
6.5	7.25
7.0	7.50
7.5	7.75
≥8.0	hours used

EQUIPMENT NOT ON THE JOB SITE NOT REQUIRED FOR ORIGINAL CONTRACT WORK

For equipment not on the job site at the time required to perform work paid by force account and not required for original-Contract work, the time paid is the time:

1. To move the equipment to the location of work paid by force account plus an equal amount of time to return the equipment to its source when the work paid by force account is completed.
2. To load and unload equipment.
3. Equipment is operated to perform work paid by force account.

NON-OWNER OPERATED DUMP TRUCK RENTAL

Submit the rental rate for non-owner-operated dump truck rental. The Engineer determines the payment rate. Payment for non-owner-operated dump truck rental is for the cost of renting a dump truck, including its driver. For the purpose of markup payment only, the non-owner-operated dump truck is rental equipment and the owner is a subcontractor.

The above markups shall constitute full compensation for all home office overhead, field office overhead, bond costs, profit, labor liability insurance, and other fixed or administrative costs that are not costs specifically designated as cost or equipment rental as stated above. The total payment made as provided above shall be deemed to be the actual cost of the work and shall constitute full compensation therefor.

SC-13.01 Delete Paragraph 13.01.E. in its entirety and insert the following in its place:

- E. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer and Construction Manager an itemized cost breakdown together with supporting data.

SC-13.02 Allowances

SC-13.02 Delete Paragraph 13.02.A. in its entirety and insert the following in its place:

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner, Engineer, and Construction Manager.

SC-13.02 Replace Engineer with Construction Manager in Paragraph 13.02.D.

SC-13.03 Unit Price Work

SC-13.03 Delete Paragraph 13.03.E in its entirety and insert the following in its place:

- E. The unit price of an item of Unit Price Work shall be subject to reevaluation and adjustment under the following conditions:
 - 1. if the extended price of a particular item of Unit Price Work amounts to 25 percent or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and
 - 2. if there is no corresponding adjustment with respect to any other item of Work; and
 - 3. if Contractor believes that Contractor has incurred additional expense as a result thereof, Contractor may submit a Change Proposal, or if Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, Owner may make a Claim, seeking an adjustment in the Contract Price.

ARTICLE 14 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

SC-14.01 Access to Work

SC-14.01 Delete Paragraph 14.01.A. in its entirety and insert the following in its place:

- A. Owner, Engineer, and Construction Manager their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

SC-14.02 Tests, Inspections, and Approvals

SC-14.02 Delete Paragraph 14.02.A. in its entirety and insert the following in its place:

- A. Contractor shall give Engineer and Construction Manager timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

SC-14.02 Delete Paragraph 14.02.C. in its entirety and insert the following in its place:

- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer and Construction Manager the required certificates of inspection or approval.

SC-14.02 Delete Paragraph 14.02.D.2. in its entirety and insert the following in its place:

- 2. to attain Owner's, Engineer's, and Construction Manager's acceptance of materials or equipment to be incorporated in the Work;

SC-14.02 Delete the paragraph following Paragraph 14.02.D.5. and insert the following in its place:

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner, Engineer, and Construction Manager.

SC-14.02 Delete Paragraph 14.02.E. in its entirety and insert the following in its place:

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, Construction Manager, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

SC-14.02 Delete Paragraph 14.02.F. in its entirety and insert the following in its place:

- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer or Construction Manager, Contractor shall, if requested by Engineer or Construction Manager, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer or Construction Manager timely notice of Contractor's intention to cover the same and Engineer or Construction Manager had not acted with reasonable promptness in response to such notice.

SC-14.03 Delete Paragraph 14.03.C. in its entirety and insert the following in its place:

- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner, Engineer, or Construction Manager has actual knowledge will be given to Contractor.

SC-14.04 Acceptance of Defective Work

SC-14.04 Delete Paragraph 14.04.A. in its entirety and insert the following in its place:

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's or Construction Manager's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer or Construction Manager as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

SC-14.05 Uncovering Work

SC-14.05 Delete Paragraph 14.05.A. in its entirety and insert the following in its place;

- A. Engineer and Construction Manager has the authority to require special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

SC-14.05 Delete Paragraph 14.05.B. in its entirety and insert the following in its place:

- B. If any Work is covered contrary to the written request of Engineer or Construction Manager, then Contractor shall, if requested by Engineer or Construction Manager, uncover such Work for Engineer's or Construction Manager's observation, and then replace the covering, all at Contractor's expense.

SC-14.05 Delete Paragraph 14.05.C. in its entirety and insert the following in its place, leaving Paragraphs 14.05.C.1. and 14.05.C.2. to remain as is:

- C. If Engineer or Construction Manager considers it necessary or advisable that covered Work be observed by Engineer or Construction Manager or inspected or tested by others, then Contractor, at Engineer's or Construction Manager's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer or Construction Manager may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

SC-14.07 Owner May Correct Defective Work

SC-14.07 Delete Paragraph 14.07.A. in its entirety and insert the following in its place:

- A. If Contractor fails within a reasonable time after written notice from Engineer or Construction Manager to correct defective Work, or to remove and replace rejected Work as required by Engineer or Construction Manager, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

SC-14.07.B. Replace the final sentence in Paragraph 14.07.B. with the following:

Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, Engineer and Engineer's consultants, and Construction Manager and Construction Manager's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

ARTICLE 15 - PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

SC-15.01 Progress Payments

SC-15.01 Replace Engineer with Construction Manager in Paragraph 15.01.A.

SC-15.01 Amend the first sentence in Paragraph 15.01.B.1 to read as follows:

- 1. At least 30 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Construction Manager for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.

SC-15.01 Add following new paragraphs immediately after the last sentence in 15.01.B.1:

- a. Payments for stored materials and equipment shall be based only upon the actual cost of the materials and equipment to Contractor and shall not include any overhead or profit to Contractor.
- b. Partial payments will not be made for undelivered materials or equipment, except for payments associated with prepurchase vendor contracts initiated by Owner and assigned to Contractor.

SC-15.01 Amend the first sentence in Paragraph 15.01.C.1 to read as follows:

- 1. Construction Manager will, within 7 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Construction Manager's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

- SC-15.01 Replace Engineer with Construction Manager at each location it appears in Paragraph 15.01.C.2. and Paragraph 15.01.C.2.c.
- SC-15.01 Replace Engineer with Construction Manager at each location it appears in Paragraph 15.01.C.3. and Paragraph 15.01.C.3.a.
- SC-15.01 Replace Engineer with Construction Manager at each location it appears in Paragraph 15.01.C.4.
- SC-15.01 Replace Engineer with Construction Manager at each location it appears in Paragraph 15.01.C.5.
- SC-15.01 Replace Engineer with Construction Manager at each location it appears in Paragraph 15.01.C.6. and Paragraph 15.01.C.6.e.
- SC-15.01 Amend the first sentence in Paragraph 15.01.D.1 to read as follows:
1. Thirty days after presentation of the Application for Payment to Owner with Construction Manager's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.
- SC-15.01 Add the following new paragraph immediately after Paragraph 15.01.D.1:
- a. Contractor shall disburse money paid to him, including any interest Contractor receives, to Subcontractors and Suppliers within 15 days after Contractor receives the money, in direct proportion to the Subcontractors' and Suppliers' basis in the total Contract between Contractor and Owner. Any money which is payable to a Subcontractor pursuant to this Section accrues interest at the legal rate. Contractor may withhold a portion of any partial payment as may be set forth in a subcontract. Thereafter Contractor shall pay any additional funds if, in the opinion of Contractor, satisfactory progress is being made in the work under the subcontract, and the payment must be equal to that paid by Owner to Contractor for the Work performed by the Subcontractor:
 - 1) The Contractor may retain the amount withheld under the subcontract until the subcontract is satisfactorily completed.
 - 2) The amount withheld under the subcontract is due within 15 days after the acceptance of the subcontract work by Contractor.
 - 3) Whenever Contractor receives a payment of interest earned on the amount withheld from the Contract, Contractor shall within 15 days pay to each Subcontractor that portion of the interest received from the state which is attributable to the amount of money withheld from the Subcontractor.
- SC-15.01 Replace Engineer with Construction Manager at each location it appears in Paragraph 15.01.E.1. and Paragraph 15.01.E.2.

SC-15.03 Substantial Completion

SC-15.03 Delete Paragraph 15.03.A. in its entirety and insert the following in its place:

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner, Engineer, and Construction Manager in writing that the entire Work is substantially complete and request that Construction Manager issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner, Engineer, and Construction Manager an initial draft of punch list items to be completed or corrected before final payment.

SC-15.03 Add the following subparagraphs immediately after Paragraph 15.03.A:

1. The Work shall be Substantially Complete when the tank, pump station, yard piping, storm drain basin, site electrical and instrumentation, pipelines and appurtenances to tie-in the City distribution system including the PRV vaults, electrical systems, and communications systems have been commissioned and are operational and the Work is able to convey water to the City of Turlcok potable water distribution system, and the Process and Operational Period of Commissioning per Section 01756 is complete and has been accepted. All equipment shall be installed and operational including the generator.
2. To be considered substantially complete, all Work must be operational and ready for Owner's continuous use as intended.
3. Portions of the Work not part of substantial completion, which can be completed without interruption of the Work operation, may be completed after the Work is accepted as Substantially Complete, and may include the following items:
 - a. Final Paving and Striping.
 - b. Landscaping and Irrigation.
 - c. Painting.
 - d. Final O&M manuals.
 - e. Spare parts.
 - c. As-built documents.
 - b. Final clean-up.

SC-15.03 Delete Paragraph 15.03.B. in its entirety and insert the following in its place:

- B. Promptly after Contractor's notification, Owner, Contractor, Engineer, and Construction Manager shall make an inspection of the Work to determine the status of completion. If Construction Manager does not consider the Work substantially complete, Construction Manager will notify Contractor in writing giving the reasons therefor.

SC-15.03 Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Construction Manager, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, shall be paid by Contractor to Owner. If Contractor does not pay, or the parties are

unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

SC-15.03 Replace Engineer with Construction Manager at each location it appears in Paragraph 15.03.C.

SC-15.04 Partial Use or Occupancy

SC-15.04 Delete Paragraph 15.04.A. in its entirety and insert the following in its place:

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, Construction Manager, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, Engineer, and Construction Manager will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
 2. At any time Contractor may notify Owner, Engineer, and Construction Manager in writing that Contractor considers any such part of the Work substantially complete and request Construction Manager to issue a certificate of Substantial Completion for that part of the Work.
 3. Within a reasonable time after either such request, Owner, Contractor, Engineer, and Construction Manager shall make an inspection of that part of the Work to determine its status of completion. If Construction Manager does not consider that part of the Work to be substantially complete, Construction Manager will notify Engineer, Owner, and Contractor in writing giving the reasons therefor. If Construction Manager considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

SC-15.05 Final Inspection

SC-15.05 Delete Paragraph 15.05.A. in its entirety and insert the following in its place:

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Construction Manager will promptly make a final inspection with Owner, Engineer, and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

- SC-15.05 Add the following new paragraph immediately after Paragraph 15.05.A:
- B. If some or all of the Work has been determined not to be at a point of Final Completion and will require re-inspection or re-testing by Construction Manager, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, shall be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

SC-15.06 Final Payment

- SC-15.06 Replace Engineer with Construction Manager in Paragraph 15.06.A.
- SC-15.06 Change title of SC-15.06.B. to Construction Manager's Review of Application and Acceptance:
- SC-15.06 Delete Paragraph 15.06.B.1. in its entirety and insert the following in its place:
1. If, on the basis of Construction Manager's observation of the Work during construction and final inspection, and Construction Manager's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Construction Manager is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Construction Manager will, within ten days after receipt of the final Application for Payment, indicate in writing Construction Manager's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Construction Manager's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Construction Manager will also give written notice to Owner, Engineer, and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Construction Manager will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- SC-15.06 Replace Engineer with Construction Manager in Paragraph 15.06.C.
- SC-15.06 Replace Engineer with Construction Manager at each location it appears in Paragraph 15.06.D.

ARTICLE 16 - SUSPENSION OF WORK AND TERMINATION

- SC-16.01 Owner May Suspend Work
- SC-16.01 Replace the first sentence in Paragraph 16.01 with the following:
- At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor, Engineer, and Construction Manager.

SC-16.02 Owner May Terminate for Cause

SC-16.02 Delete Paragraph 16.02.A.4. in its entirety and insert the following in its place:

4. Contractor's repeated disregard of the authority of Owner, Engineer, or Construction Manager.

SC-16.02 Replace Engineer with Construction Manager at each location it appears in Paragraph 16.02.E.

SC-16.03 Owner May Terminate For Convenience

SC-16.03 Replace the first sentence of Paragraph 16.03.A. with the following:

Upon seven days written notice to Contractor, Engineer, and Construction Manager, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract.

SC-16.04 Contractor May Stop Work or Terminate

SC-16.04 Delete Paragraph 16.04.A. and Paragraph 16.04.B. in their entirety and insert the following in their place:

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Construction Manager fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner, Engineer, and Construction Manager, and provided Owner, Engineer, or Construction Manager do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Construction Manager has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner, Engineer, and Construction Manager stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 - FINAL RESOLUTION OF DISPUTES

SC-17.01 Methods and Procedures

SC-17.01 Add the following subparagraphs immediately after Paragraph 17.01.B.3:

4. resolve claims of \$375,000 or less pursuant to California Public Contract Code Section 20104 et seq., unless Owner elects to resolve the dispute pursuant to California Public Contract Code Section 10240 et seq.

ARTICLE 18 - MISCELLANEOUS

SC-18.04 *Limitation of Damages*

SC-18.04 Delete Paragraph 18.04.A. in its entirety and insert the following in its place:

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner, nor Engineer, nor Construction Manager, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

END OF DOCUMENT

^{AD3} Addendum No. 3

SECTION 01140
WORK RESTRICTIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Requirements for scheduling the Work affected by existing site and facility, work restrictions, and coordination between construction operations and plant operations.

1.02 SUBMITTALS

- A. Baseline Schedule with MOP tasks.
- B. Method of Procedure (MOP) Form.
- C. Method of Procedure (MOP) Log.
- D. Progress Schedule with MOP tasks.

1.03 GENERAL CONSTRAINTS ON WORK AND SCHEDULING OF WORK

- A. Work sequence and constraints:
 - 1. Utilize description of critical events in work sequence in this Section as a guideline for scheduling and undertaking the Work.
 - 2. Work sequence and constraints presented do not include all items affecting completion of the Work but are intended to describe critical events necessary to minimize disruption of the existing facilities and to ensure compliance with discharge permit requirements.
- B. Instrumentation and controls process performance testing:
 - 1. After the Process Operational Period, test PCIS system as specified in Section 01756.

1.04 COORDINATION WITH OTHER CONSTRUCTION PROJECTS

- A. Prior to, during, and after construction the Stanislaus Regional Water Authority's (SRWA) design-builder will be constructing SRWA facilities in Quincy Road and the Terminal Tank Site as approximately shown in the drawings.
 - 1. Contractor shall anticipate the need to coordinate adjacent work and access to the SRWA design-builder.
 - 2. The General scope of work by SRWA's design-builder and tentative timing of the work (subject to change) includes:
 - a. 42-inch pipeline and flow meter vault at the Terminal Tank Site and in the Terminal Tank Site access road from Quincy Road:
 - 1) Approximately from October 1, 2021 to April 30, 2022.
 - b. 42-inch pipeline and appurtenance construction in Quincy Road from the Terminal Tank Site access road to Zeering Road:
 - 1) Approximately from May 1, 2022 to June 30, 2022.

- c. Interior welding and mortar installation of steel pipe joints at the Terminal Tank site and Quincy Road:
 - 1) November 1, 2022 to December 31, 2022.
- d. Final Paving of Quincy Road as shown on the Drawings.
 - 1) Approximately from March 1, 2023 to May 31, 2023.
- e. Installation of the Radio Tower:
 - 1) Approximately 4 weeks in duration within the window from June 1, 2022 to September 30, 2022.
- f. Installation of SRWA Equipment in the SRWA Room within the Pump Station Building and pulling of cable within conduits.
 - 1) Approximately August or September 2022 through final completion.
- g. Testing of the SRWA pump station:
 - 1) SRWA perform testing of their finished water pump station by pumping water to the Terminal Tank. SRWA will fill the tank one time per week over the duration. The Contractor will be required to drain the tank to the overflow basin and operate the stormwater pump station to drain the overflow. Contractor will be required to re-disinfect the tank after the SRWA pump test.
 - 2) Approximately 2 weeks in duration from January 1, 2023 through March 1, 2023.

1.05 SHUTDOWN AND CONSTRUCTION CONSTRAINTS

- A. General shutdown constraints:
 - 1. The majority of Work activities can be accomplished without a shutdown.
 - 2. Apply to activities of construction regardless of process or work area.
 - 3. Activities that disrupt plant or utilities operations must comply with these shutdown constraints.
 - 4. Organize work to be completed in a minimum number of shutdowns.
 - 5. Provide thorough advanced planning, including having required equipment, materials, and labor on hand at time of shutdown.
 - 6. Where required to minimize treatment process interruptions while complying with specified constraints, provide temporary pumping, power, lighting, controls, instrumentation, and safety devices.
 - 7. Final determination of the permitting of shutdowns will be the sole judgment of the Owner.
 - 8. Owner maintains the ability to abort on the day of the scheduled shutdown.
- B. General maximum plant flow work limitations:
 - 1. Activities that disrupt City's operations are prohibited during the following flow conditions, unless otherwise approved in writing by the Owner and Engineer.
- C. Shutdown activities:
 - 1. Tie-ins to the City's potable water distribution system.
 - 2. Scheduling:
 - a. 4 weeks in advance, request for approval date for shutdown to tie-into the City's water distribution system.
 - b. 1 week in advance, confirm the date for the shutdown.
 - c. Perform work on a Tuesday, Wednesday, or Thursday.

- d. Work shall be performed in a single, continuous operation until the tie-in is complete and service is restored and within a single 8-hour period.
 - e. Work shall include dewatering the existing pipeline prior to the tie-in and flushing of existing pipeline that was depressurized for the tie-in.
3. Unplanned shutdowns due to emergencies are not defined in this Section.

1.06 OPERATIONS AND MAINTENANCE ACCESS

- A. Provide safe, continuous access to City and City designated personnel.

1.07 UTILITIES

- A. Provide advance notice to and utilize services of Underground Services Alert (U.S.A.) for location and marking of underground utilities operated by utility agencies other than the Owner.
- B. Maintain electrical, telephone, water, gas, drainage, HVAC, sanitary facilities, and other utilities within existing facilities in service. Provide temporary utilities when necessary.
- C. Contractor shall use care when excavating around existing laterals and shall anticipate each property as a gas, water, and sewer lateral. Contractor shall not intentionally trench through laterals and disrupt service. If service is unintentionally disrupted, Contractor shall notify property owner and Construction Manager immediately and restore service within 1 hour.
- D. New utilities were designed using existing facility drawings provided by others:
- 1. Field verification of all utilities locations was not performed during design.
 - 2. Services crossed or located nearby new yard utilities may require relocation and possible shutdowns. Individual residential and commercial utility laterals are not all shown on the drawings. Contractor shall be responsible for all costs of relocation and shutdowns. Contractor shall notify utility customer a minimum 2 weeks in advance of utility relocation and limit duration of utility outage to each customer to a single working day.
 - 3. Pipe alignments as indicated on the Drawings.
- E. Trenching and Excavating near gas pipelines and high voltage power lines:
- 1. Unless otherwise required by the utility owner, the Contractor shall comply with the following requirements:
 - a. All digging within 2 feet of the edge of gas pipelines, high voltage electrical power lines, and high voltage duct banks must be performed by:
 - 1) Hand digging.
 - 2) Vacuum excavation.
 - a) Water jetting to assist vacuum excavation, if used, must be limited to 1,000 psig and directed at a 40 degree angle away from the existing utility.
 - 3) Contractor shall submit work plans to the utility owner and obtain approval prior to performing the work.
 - b. All plans to expose and support a gas pipeline larger than 2-inches across an open excavation need to be approved by the utility prior to performing the work.
 - c. All pile driving and vibratory shoring must be kept a minimum of 3 feet away from the existing utility.

- F. Turlock Irrigation District (TID) - 12kV and 115kV power lines:
1. Contractor shall contact TID prior to working near the power lines along the pipeline alignment and other areas and submit work plan for review/approval to TID. Contractor shall perform work in accordance with TID's and California OSHA safety requirements. All costs associated with working near the powerlines or support of the power poles shall be borne by the Contractor. The Contractor shall verify the following work restrictions with TID.
 2. When working near TID power lines follow all CAL-OSHA safety requirements and work setbacks.
 3. Equipment shall maintain a minimum separation distance from energized power lines, even if the power lines are covered with protection.
 4. The minimum separation distance for lifting and hoisting equipment from a 12 kV power line is 10 feet.
 5. The minimum separation distance for lifting and hoisting equipment from a 115 kV power line is 13 feet.
 6. Work that involve a crane and or equipment which qualifies as a crane per CAL-OSHA must maintain 20 feet clearance from energized lines.
 7. TID requires a 1:1 slope (Horizontal:Vertical) for any excavation near TID power poles. For example, a trench or excavation 7 feet in depth requires is required to be 7 feet from the face of the TID power pole. The Contractor will need to design, submit and obtain TID approval prior to installation, and install a shoring system to support the TID power pole if work is closer to a pole than the 1:1 requirement.
- G. Turlock Irrigation District (TID) - Irrigation and Drainage Pipeline Crossing at STA 133+45±:
1. No work around irrigation pipeline shall occur during the irrigation season.
 - a. The TID irrigation season is typically March 1st to November 1st.
 - b. Depending on the year, the exact dates of the irrigation season will change.
 - 1) Contractor shall anticipate the irrigation season start date may occur up to 2 weeks early.
 - 2) Contractor shall anticipate the irrigation season end date may occur up to 2 weeks late.
 - c. Contractor is responsible for coordinating with TID to confirm irrigation dates and coordinate work near TID facilities.
 - 1) Notify TID 2 weeks in advance of crossing a TID pipeline to coordinate timing of the crossing.
 2. Contractor shall expect that irrigation pipes are not watertight and may leak. Contractor shall expect approximately 25 gpm of leakage from each pipe; water from pipe leakage will need to be removed consistent with Section 02241.
 3. Per Section 02280 perform a CCTV inspection of the pipeline or culvert to determine its condition and after crossing the utility (regardless if a repair was made), perform a post-construction CCTV to document the condition after construction has been completed.
 4. Contractor shall take precautions working around TID pipeline, since it is likely unreinforced cast in place concrete.
 - a. Contractor shall fully support TID pipeline during trenching.
 - b. Contractor shall backfill the trench with CLSM per Section 02312 from the bottom of the trench to not less than 1 foot above the TID pipeline.

- H. Turlock Irrigation District (TID) – New Electrical Service:
1. Contractor shall coordinate with TID and pay for a new electrical service for at the East Monte Vista Drive / Brookstone Drive Pressure Reducing Station. The Bid Table includes an allowance for reimbursement the actual cost of the new electrical service fees.^{AD2}
 2. For reference, a TID meter card is included in the Appendix.
 3. Contractor shall pay for the ongoing electrical usage costs until the electrical service is transferred to the City of Turlock.^{AD2}
 - ~~3.4.~~ After substantial completion, and prior to final completion, transfer the electrical service to the City of Turlock.
- I. Abandon Groundwater Well on Terminal Tank Site:
1. The existing groundwater well and associated facilities (well, pump, pump house, electrical equipment, piping and appurtenances, and electrical service) shall be abandoned by the Contractor and the Contractor shall pay all fees and costs associated with well and associate facilities abandonment. Contractor shall obtain and pay for a well abandonment permit from Stanislaus County <http://www.stancounty.com/er/pdf/water-well-construction-and-destruction-application.pdf>), abandon the well per Stanislaus County requirements, and submit for record copies of permit, abandonment plan and completion, and acceptance of the abandonment by the County.
 2. For the purpose of bidding, the Contractor shall assume a 50-foot well depth, 8-inch diameter well casing, 8-inch diameter mechanical piping and valves located within the building, 50 hp well pump, electrical and power distribution system, reinforced concrete floor and wood framed well house.^{AD3}

1.08 WORK SEQUENCE AND CONSTRAINTS

- A. Environmental Constraints:
1. Mitigation, Monitoring, and Reporting (MMRP) Requirements:
 - a. The Contractor is required to comply with the MMRP Requirements included as an Appendix to the Contract Documents.
 2. Contractor shall comply with the construction work requirements of all project permits and regulatory consultations, which are included in Volume 4 of the Contract Documents.
- B. Work Restrictions near Nesting Birds:
1. Birds may nest in trees and other vegetation immediately adjacent to all Project Work areas.
 2. The nesting period is from February 15 to August 31 each year.
 3. If construction activities have not already commenced when a bird establishes a nest, the Contractor will not be permitted to commence construction activities within a buffer area around the nest. Typical buffer areas are a 300-foot radius for non-listed raptors and special-status passerines and a 100-foot radius for non-listed passerines. Buffer areas for Swainson's hawk nests will be a maximum of 1/2 mile. Buffer distances will be confirmed by the City's third party biologist. Buffers will be maintained until fledglings are fully mobile and not reliant on the nest or parental care for survival, as determined by the City's biologist. If a lapse in project-related work occurs for 2 weeks, additional surveys may be required.
 4. If a bird establishes a nest adjacent to active construction, construction activities will not be permitted to increase in intensity (noise, vibration, lighting,

work hours, etc.) until the nesting period has ended or fledglings are no longer reliant on the nest. In the case of a Swainson's hawk nest, a no-work buffer around the nest location will be required, even if active construction work has commenced at the site. The size of the no-work buffer will be a maximum of 1/2 mile, but may be smaller, as determined by the City's biologist.

5. To reduce the potential impacts to construction from nesting birds, the Contractor should consider commencing construction activities near potential nesting sites prior to February 15.
6. The City will hire a third party biologist to perform biological monitoring during construction.
7. Due to the proximity of nesting raptors, no work is permitted along E. Zeering Road between April 15 to July 15 each year unless otherwise approved by the City and the third party biologist. Contractor shall schedule the project anticipating no work will be permitted.

C. Stanislaus County:

1. Obtain an encroachment permit from Stanislaus County.
 - a. A draft permit is included in the Appendix of these Contract Documents.
 - b. Road closures are at the Contractor's discretion and subject to County approval. Contractor shall pay for all road closure fees. For bid purposes, anticipate road closures within Stanislaus County are subject to of the following fees:
 - 1) Quincy Road: Zeering to Monte Vista: \$1,000/day.
 - 2) Quincy Road: Monte Vista to City Limit: \$1,500/day.
 - 3) Zeering Road: City Limits to Quincy: \$1,500/day.
 - 4) Monte Vista Ave: City Limits to Quincy: \$3,500/day.

D. City of Turlock:

1. Obtain an encroachment permit from the City of Turlock.
 - a. A draft permit is included in the Appendix of these Contract Documents.
 - b. The permit fee is \$0.
 - c. ~~The Contractor will not be allowed to entirely close a public street within City limits. It is the City's expectation to maintain use of public streets for as long as possible, to include preference for the use of lane reductions or shoulder closures over the use of complete street closures.~~
2. Road Closures:
 - a. The Contractor may be permitted to close Quincy Road provided that at the end of each workday, trenches are backfilled and temporarily paved, or plated, for the road to be opened. The intersection of Quincy and Tuolumne shall not be closed.
 - b. The Contractor will not be allowed to entirely close a public street without the written approval of the City. The method and procedure used to close a public street shall be subject to the approval of the City.
 - c. It is the City's expectation to maintain use of public streets for as long as possible, to include preference for the use of lane reductions or shoulder closures over the use of complete street closures. If approved, the details and conditions of the closure will be outlined in the Traffic Control Plan per Section 01550, including traffic detour routes. The Contractor shall be responsible for notifying the residents or businesses adjacent to the closure area or otherwise directly affected by the closure. Contractor shall coordinate with Construction Manager to notify regional police, fire,

ambulance, transit, utility companies, and other affected public agencies.^{AD2}

2.3. Obtain of commercial wastewater discharge permit from the City of Turlock for discharge of dewatered groundwater.

- a. A draft permit is included in the Appendix of these Contract Documents.
- b. There is no fee to obtain the permit, however once the permit is obtained the following fees will be required to be paid by the Contractor:
 - 1) \$2.27 per 1000 gallons discharged to the sanitary sewer system.
 - 2) A monthly admin fee of \$8.17.

E. For all work in public roads:

1. Develop a Traffic Control Plan per Section 01550.

1.09 AIR POLLUTION CONTROL

- A. The Contractor shall comply with all air pollution control rules, regulations, ordinances and statutes which apply to any work performed pursuant to the Contract Documents, including any air pollution control rules, regulations, ordinances and statutes, specified in California Government Code section 11017.
- B. The Contractor shall comply with all applicable regulations of the San Joaquin Valley Air Pollution Control District (www.valleyair.org). The Contractor is hereby alerted to the fact that the San Joaquin Valley Air Pollution Control District imposes specific restrictions and requirements on the Contractor related to the construction activities at the site of the Work, including but not limited to the Indirect Source Review (ISR) rule. The Contractor assumes full responsibility for conforming to the San Joaquin Valley Air Pollution Control District's restrictions and requirements as well as application/permit fees. More information on the ISR rule can be found at <http://www.valleyair.org/ISR/ISRHome.htm>. The ISR application is included in the Appendices.
 1. In the event the regulatory agency levies any fine or charge against the Owner as a result of the Contractor's failure to comply with this regulation, the Contractor shall reimburse the Owner upon demand the full amount of said fine. The Owner shall have the right to deduct funds from monies due the Contractor should the Contractor fail to reimburse the Owner as stated herein.
 2. ISR application information regarding the Owner will be provided by the Owner.
 3. The Contractor is required to obtain and pay for all permits for the generator. See Section 16232 for additional information.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

APPENDIX A
“Method of Procedure” (MOP)
Instructions and Forms

Definition and Purpose

“Method of Procedure” (MOP) is a detailed document submitted by the Contractor to request process shutdown(s), utility tie-in(s), work in areas that may risk unanticipated outages, or flow diversions to accommodate site construction activities during a project. Such activities may include (but are not limited to) new tie-ins to utilities or structures, mechanical modifications to process piping or equipment, demolition, bulkhead installation, and cleaning processes.

The MOP provides a detailed plan to the Owner and Engineer that describes specific aspects of the work including purpose, time of execution, and anticipated impacts on treatment processes. The MOP also includes contingency measures and provisions for rapid closure in the event that shutdown or work progress difficulties are encountered. Information from relevant trades associated with the requested shutdown, diversion, or tie-in is also included.

The Owner should use the information within the MOP to define operational procedures and methods to safely and successfully assist the Contractor.

MOP Process Summary

WHO	STEP	TIMING
Contractor	1. Identify MOPs needed on MOP Log and Baseline Schedule.	No later than 7 days prior to Preconstruction Scheduling Meeting
Contractor, Owner, Engineer	2. Pre-MOP Meeting.	More than 28 days prior to work
Contractor	3. Submits MOP.	No later than 28 days prior to work
Owner	4. Reviews MOP.	
Owner	5. MOP finalized.	No later than 7 days prior to work
Contractor	6. Complete Readiness Checklist.	No later than 5 days prior to work
Contractor	7. Complete Safety Checklist.	Immediately prior to commencing work
Contractor	8. Complete Work.	
Contractor	9. Update MOP Log and Progress Schedules.	Monthly

MOP Process Detail

STEP 1. Identifies MOPs needed on MOP Log and Baseline Schedule.

Contractor submits a preliminary list of anticipated project MOPs on MOP Log. MOPs identified but not limited to those shutdowns, diversions, or tie-ins described in the Contract Documents. Incorporate MOPs as tasks in Baseline Schedule. Date scheduled MOPs to coincide with the appropriate construction activities.

STEP 2. Pre-MOP Meeting.

Contractor requests a Pre-MOP Meeting with the Owner and Engineer to discuss the nature of the shutdown, diversion, or tie-in, and to gather the information necessary to complete the MOP Form. The pre-MOP meeting may be waived by the Owner or Engineer if the work is deemed to be minor.

STEP 3. Submits MOP.

Contractor completes the MOP Form and submit 3 copies for approval to the Owner's Project Manager (OPM).

STEP 4. Reviews MOP.

OPM distributes MOP Form for review by the Owner's Construction Coordinator, O&M Representative, and Engineer's Project Representative. Review MOP Form for completeness, accuracy, compliance with both the construction schedule, constraints defined in contract documents, and to ensure that the requested work does not negatively impact plant operations or other concurrent project activities. Additional information may be requested to better understand the nature of and method for completing the Work.

STEP 5. MOP finalized.

Once the MOP is agreed to by all parties, the MOP will be finalized by signature. Copies are distributed to the Owner, Engineer, and Contractor.

STEP 6. Complete Readiness Checklist.

Contractor verifies everything is ready for the work.

STEP 7. Complete Safety Checklist.

Contractor ensures safety.

STEP 8. Complete work.

Contractor complete work.

STEP 9. Update MOP Log and Progress Schedules.

Contractor updates MOP Log weekly and distributes at the regularly scheduled construction progress meetings.



METHOD OF PROCEDURE (MOP) FORM

Owner: _____ Date: _____
Contractor: _____ Carollo Project No.: _____
Project Name: _____ Submittal No.: _____
Submittal Title: _____ Spec/Dwg. Reference: _____

MOP #	Task Title (Provide <10 word title):	Submittal Date: (No later than 28 days prior to work)
-------	--------------------------------------	---

SCHEDULE OF WORK ACTIVITY START: (Date/Time) _____ END: (Date/Time) _____

REQUESTOR: _____

PRIMARY POINT OF CONTACT: _____

PHONE/PAGER: _____

SECONDARY POINT OF CONTACT: _____

PHONE/PAGER: _____

NOTIFY ☐ Control Room, Phone

☐ Security, Phone

BUILDING: _____

LOCATION OF WORK FLOOR/LEVEL: _____

DESCRIPTION OF WORK: (Provide sufficient details on process isolation, work sequencing, and safety (i.e., control of significant hazards unique to the work) to demonstrate an understanding of the work and how it will be completed within the constraints, and its impact on the processes and facility.)

Task Summary: _____

Processes

Affected: _____

Trades Affected: _____

WORK PLAN:

Work Sequencing: _____

Process Isolation: _____

Spill Prevention

Plan: _____

Contingency

Plans: _____

CRITICAL EQUIPMENT/TOOLS: (pumps and discharge hoses with correct fittings, blind flanges and pipe plugs, no-hub fittings, properly sized electrical service components, generators, portable lighting, chlorine for potable water pipe breaks, etc.)

<input type="checkbox"/>	Acoustic Ceiling/or Walls Access	<input type="checkbox"/>	Excavation Permit	<input type="checkbox"/>	Lock Out/Tag Out
<input type="checkbox"/>	Chemical Use Approval	<input type="checkbox"/>	Fire Sprinkler Impairment	<input type="checkbox"/>	Life Safety Systems
<input type="checkbox"/>	Confined Space Permit	<input type="checkbox"/>	Flammable Materials	<input type="checkbox"/>	Roof Protocol
<input type="checkbox"/>	Critical Lift Plan	<input type="checkbox"/>	Flush / Discharge	<input type="checkbox"/>	Work After Dark
<input type="checkbox"/>	Energized Electrical Work	<input type="checkbox"/>	High Pressure Test	<input type="checkbox"/>	
<input type="checkbox"/>	Elect. Panel Schedules	<input type="checkbox"/>	Hot Work/Open Flame	<input type="checkbox"/>	

EXISTING SERVICE(S) AT RISK:

<input type="checkbox"/>	Breathing Air	<input type="checkbox"/>	Elect Normal	<input type="checkbox"/>	Process Access	<input type="checkbox"/>	Telephones
<input type="checkbox"/>	Chemical Distribution	<input type="checkbox"/>	Fire Protection	<input type="checkbox"/>	Safety Showers	<input type="checkbox"/>	UPS
<input type="checkbox"/>	City Water	<input type="checkbox"/>	HVAC	<input type="checkbox"/>	SCADA	<input type="checkbox"/>	VAX/DATA
<input type="checkbox"/>	Communication	<input type="checkbox"/>	Inert Gas	<input type="checkbox"/>	Security	<input type="checkbox"/>	
<input type="checkbox"/>	Domestic Drain	<input type="checkbox"/>	Instrument - Air	<input type="checkbox"/>	Solvent Drain	<input type="checkbox"/>	
<input type="checkbox"/>	Elect-Bus Duct	<input type="checkbox"/>	Life Safety System	<input type="checkbox"/>	Specialty Gases	<input type="checkbox"/>	

Work Restrictions

01140-10

pw://Carollo/Documents/Client/CA/Turlock/11380B10/Specifications/00111 (AD3)

11380B10

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<input type="checkbox"/>	Elect Emergency	<input type="checkbox"/>	Natural Gas	<input type="checkbox"/>	Storm Drain	<input type="checkbox"/>	
REVIEWER'S INSTRUCTIONS / COMMENTS:							
<input type="checkbox"/>	PREJOB BRIEFING MUST BE COMPLETED PRIOR TO COMMENCING WORK:						
	Full Name (printed)	Signature	Phone	Date			
Submitted By							
System Owner							
Reviewer (if needed)							
Reviewer (if needed)							
Reviewer (if needed)							
Reviewer (if needed)							

READINESS CHECKLIST
(5 days prior to work)

Checklist provided as a guide but is not all inclusive.

1. Confirm all parts and materials are on site: _____

2. Review work plan: _____

3. Review contingency plan: _____

SAFETY CHECKLIST
(Just prior to commencing work)

Checklist provided as a guide but is not all inclusive.

1. Location awareness:
 - a. Emergency exits: _____
 - b. Emergency shower and eyewash: _____
 - c. Telephones and phone numbers: _____
 - d. Shut-off valve: _____
 - e. Electrical disconnects: _____
2. Inspect work area:
 - a. Take time to survey the area you are working in. Ensure that what you want to do will work. Do you have enough clearance? Is your footing secure? Do you have adequate lighting and ventilation? Are surrounding utilities out of the way for you to perform your work?
3. SDS (Safety Data Sheets):
 - a. Understand the chemicals and substances in the area you are working in by reading the SDS.
4. Lockout/Tagout Procedure:
 - a. Lockout/tagout energy sources before beginning work.
 - b. Make sure all valves associated with the work are locked out and tagged out on each side of the penetration.
 - c. Make sure the lines are depressurized.
5. Overhead work:
 - a. Use appropriate personal protective equipment; i.e., safety harness, lifeline, etc.
 - b. Select appropriate tie-off points; i.e., structurally adequate, not a pipe or conduit, etc.
 - c. Spotter assigned and in position.
 - d. Pipe rack access; i.e., check design capacity, protective decking or scaffolding in place, exposed valves or electrical switches identified and protected.
6. Safety equipment:
 - a. Shepherd's hook.
 - b. ARC flash protection.
 - c. Fire extinguisher.
 - d. Other: _____.
7. Accidents:
 - a. Should accidents occur, do not shut off and do not attempt to correct the situation, unless you are absolutely positive that your action will correct the problem and not adversely affect other people or equipment.
8. Review process start-up documents:
 - a. In the event the system is shutdown, the Control Center should have a working knowledge of the process start-up procedures in order to deal effectively with unforeseen events.
9. Evacuation procedures:
 - a. Do not obstruct evacuation routes.
 - b. Take time to survey the area for evacuation routes.

Method of Procedure (MOP) Log
Sample

MOP Number	Task Title	Date Requested	Date Approved	Date Work Planned	Work Completed (yes/no)
001					
002					
003					

^{AD2} Addendum No. 2

^{AD3} Addendum No. 3

New Section

SECTION 01170^{AD3}

NOVEL CORONAVIRUS (COVID-19) SAFETY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: COVID-19 safety requirements in response to the need for work on essential construction projects that are permissible under the Stanislaus County Health Services COVID-19 Safety Orders and applicable State and Federal guidelines/orders, to continue as safely as possible.
- B. These COVID-19 safety requirements are not all encompassing and may need to be modified by the Contractor to individual construction tasks and updated as the COVID-19 pandemic evolves.
- C. The Contractor and all its sub-tier level subcontractors and suppliers shall account in their Bid and sub-bids for all cost impacts whether affecting labor (including, but not limited to obtaining qualified workers, quantity of workers, as well as their productivity), deliveries, supervision, testing and/or procurement of materials and/or equipment and time caused by COVID-19 safety requirements found in this Section 01170 - Novel Coronavirus (COVID-19) Safety Requirements and also all public health and/or governmental directives in place at the time Bids are received by the Owner for this Project.
- D. Related Sections:
 - 1. Section 00200 - Instructions to Bidders.
 - 2. Section 00700 - General Conditions.
 - 3. Section 01330 - Submittal Procedures.

1.02 COVID-19 EXPOSURE PREVENTION, PREPAREDNESS, AND RESPONSE PLAN

- A. Contractor's Responsibility:
 - 1. The Contractor shall prepare a COVID-19 Exposure Prevention, Preparedness and Response Plan specific to this Project that describes how to prevent worker exposure to coronavirus, protective measures to be taken on the jobsite, personal protective equipment and work practice controls to be used, cleaning and disinfecting procedures, and what to do if a worker(s) shows symptoms of COVID-19 illness or tests positive for COVID-19. The Contractor should review the latest OSHA COVID-19 Workplace Safety Guidance document (<https://www.osha.gov/Publications/OSHA3990.pdf>) as a resource in preparation of their Site Specific Health and Safety Plan. Other reliable and current sources of COVID-19 information can be found at:

California Department of Public Health (CDPH, State)

<https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Immunization/nCOV2019.aspx>

Centers for Disease Control and Prevention (CDC, National)

<http://www.cdc.gov/coronavirus/novel-coronavirus-2019.html>

2. This plan shall at a minimum address the following COVID-19 safety guidelines:
 - a. COVID-19 Employee and Visitor training and check-list before entering worksite.
 - b. Employee distancing and strategies to maximize distancing when possible.
 - c. Limitations on gathering size.
 - d. Personal Protective Equipment (PPE) requirements.
 - e. Identify “choke points” and “high risk areas” such as hallways, hoists and elevators, break areas and vehicles.
 - f. Stagger trades and modify work schedules to reduce worker density to maximize distancing opportunities.
 - g. COVID-19 employee good personal hygiene measures.
 - h. Disinfecting and cleaning requirements.
 - i. Personal prevention actions requirements for all employees.
 - j. Toolbox and Tailgate COVID-19 employee training.
 - k. Recognizing COVID-19 Symptoms.
 - l. Establish a COVID-19 Exposure Action and Notification Plan.
 - m. Establish daily screening protocols for arriving workers and visitors to ensure potentially infected workers and visitors do not enter the Site.
 - n. Maintain daily attendance log of all workers and visitors who enter the Site.
3. Also, as part of this Plan, the Contractor shall draft and implement a COVID-19 Code of Safe Practices that is posted in areas visible to all employees and visitors.
4. The Contractor shall be prepared at each Progress and Coordination Meeting, if requested by the Construction Manager, to provide information relevant to the application, enforcement and implementation of such COVID-19 Safe Practices.
5. All Contractor managers and supervisors from forepersons to project managers must be familiar with this Plan and be ready to answer questions from employees, subcontractors, suppliers and visitors. Managers and supervisors must set a good example by following this Plan at all times. This involves practicing good personal hygiene and jobsite safety practices to prevent the spread of the virus. Managers and supervisors must encourage this same behavior from all employees, subcontractors, suppliers and visitors.
6. The Contractor shall immediately notify the Construction Manager if any person under the Contractor’s control on this Project has tested positive for COVID-19.

1.03 SUBMITTALS

- A. The following information shall be provided in accordance with Section 01330 - Submittal Procedures, after the Award of Contract and before any work begins at the Site:
 1. COVID-19 Exposure Prevention, Preparedness and Response Plan.
 2. COVID-19 Code of Safe Practices.
- B. To the extent that there are material amendments or modifications made to any of the above plans or practices during the performance of the Work, the Contractor shall provide to the Owner as soon as practicable the amendments and shall post them as part of the notification plan to all employees and visitors who enter the Site.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

^{AD3} Addendum No. 3

SECTION 01201

PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Procedures for submitting applications for payment and means used as a basis for Progress Payments, including:
 - 1. Cost Summaries.
 - 2. Payment for Mobilization.
 - 3. Commissioning and Process Start-Up.
 - 4. Demobilization.

1.02 REFERENCES

- A. Occupational Safety and Health Administration (OSHA).

1.03 BASIS FOR PROGRESS PAYMENTS

- A. Base Application for Payment on the breakdown of costs for each scheduled activity in the Progress Schedule and the Percentage of Completion for each activity. Generate Application for Payment by downloading cost data from the Progress Schedule to a spreadsheet type format. Identify each activity on the Progress Schedule that has a cost associated with it, the cost of each activity, the estimated Percent Complete for each activity, and the Value of Work Completed for both the payment period and job to date.

1.04 PAYMENT REQUESTS

- A. Prepare progress payment requests on a monthly basis. Base requests on the breakdowns of costs for each scheduled activity and the percentage of completion for each activity.
- B. Indicate total dollar amount of work planned for every month of the project. Equate sum of monthly amounts to Lump Sum Contract Price.
- C. Generate Progress Payment request forms by downloading cost data from the schedule information to a spreadsheet type format. Identify each activity on the Progress Schedule that has a cost associated with it, the cost for each activity, the estimated percent complete for each activity, and the value of work completed for both the payment period and job to date.
- D. Provide Summary of Cost Information.

1.05 REQUIREMENT TO ESTABLISH DISPUTES REVIEW BOARD

- A. Prior to Contractor submitting second payment request, members of the Disputes Review Board shall be selected and the Disputes Review Board Three Party Agreement shall be executed per Section 00822.^{AD3}

1.051.06 COST SUMMARIES

- A. Prepare Summary of Cost Information for each Major Item of Work listed in the Schedule of Values. Identify the Value of Work Completed for both the payment period and job to date.
- B. Cash flow summary: Prepare cash flow summary, indicating total dollar amount of work planned for each month of the project. Equate sum of monthly amounts to Lump Sum contract price.

1.061.07 PAYMENT FOR MOBILIZATION

- A. Limit amounts included under mobilization to the following items:
 - 1. Moving on the site any equipment required for first month operations.
 - 2. Installing temporary construction power, wiring, and lighting facilities.
 - 3. Establishing fire protection plan and safety program.
 - 4. Developing construction water supply.
 - 5. Providing field office trailers for the Contractor and the Construction Manager, complete with all specified furnishings and utility services including telephones.
 - 6. Providing on-site sanitary facilities and potable water facilities as specified.
 - 7. Arranging for and erection of Contractor's work and storage yard, employee parking facilities, and entrance road.
 - 8. Submit all required insurance certificates and bonds.
 - 9. Obtaining all required permits, licenses, and fees.
 - 10. Submit preliminary schedule of values of the Work.
 - 11. Submit preliminary schedule and develop baseline schedule.
 - 12. Submit standardized traffic maintenance and control plans.
 - 13. Submit cash flow in tabular and graphical formats.
 - 14. Submit Contractor's quality control plan.
 - 15. Submit Schedule of Submittals.
 - 16. Submit pre-construction photographs and videos.
 - 17. Provide and erect the project sign.
 - 18. Post all OSHA, (state agency), Department of Labor, and all other required notices.
 - 19. Location and flagging of construction and clearing.
 - 20. Have Contractor's project manager and/or general superintendent on job site full-time.
- B. Furnish data and documentation to substantiate the amounts claimed under mobilization.
- C. No payment for mobilization, or any part thereof, will be recommended until all mobilization items listed above have been completed.

1.071.08 PAYMENT FOR COMMISSIONING AND PROCESS START-UP

- A. Total Price for commissioning and process start-up shall not be less than 1 percent of Contract Price.

1.081.09 PAYMENT FOR DEMOBILIZATION

- A. Total Price for demobilization shall not be less than 25% of the total price for mobilization.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

^{AD3} Addendum No. 3

SECTION 01220

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Procedures for measurement and payment of Work under this Contract for lump sum items and unit prices.

1.02 REFERENCES

- A. Occupational Safety and Health Administration (OSHA).

1.03 BASE BID ITEMS

- A. General: The following pay items are included in Document 00410.
- B. Schedule of bid items:
 - 1. Bid Item 1: Mobilization and Demobilization (Not to be Greater than 4 percent of the Total Unit Price Bid).
 - a. Bid Item Description: Work in this bid item generally includes Mobilization and demobilization, complete as specified, including, but not limited to, performing preconstruction video and picture documentation, cost of obtaining all necessary permits not obtained by the City, cost for complying with all conditions set by all of the required permits, move in of equipment, tools, supplies, materials, and manpower to the jobsite, move out, cleanup and topsoil removal, restoration, and fine grading of the job site after the project is complete and accepted by the City.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - a. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
 - 2. Bid Item 2: Terminal Tank Site Sitework
 - a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other sitework activities, including clearing and grubbing existing site to prepare for the necessary excavations, earthwork, grading, trenching, yard piping and inspection manways on Terminal Tank Site – Yard Piping drawings^{AD3}, 54-inch potable pipeline, site electrical, equipment installation, stockpiling all topsoil and regrading upon completion of construction, landscaping, landscape irrigation, site fencing, site paving, grading, compaction to site civil grading, and surface rock as indicated in the Contract Documents and outlined in these technical specifications and demolition of the existing well, well house and electrical service on site and all Work (excluding items included in other bid items) per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - b. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.

3. Bid Item 3: Terminal Tank Site Concrete Reservoir
 - a. Bid Item Description: Work in this bid item generally includes installation of the 2.3 MG prestressed concrete reservoir. Work generally includes reservoir earthwork and subgrade preparation, over-excavation, foundation construction, piping and mechanical equipment, monitoring and control equipment, and construction of the tank in accordance with the requirements as outlined in these specifications, specified testing procedures, and all other work (excluding items included in other bid items) necessary to install the concrete reservoir complete and in place per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
4. Bid Item 4: Terminal Tank Site Pump Station
 - a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities to construct the terminal tank site pump station and ancillary facilities including costs to administer and install owner-furnished equipment per Section 01640 and all other associated costs^{AD2}. Work includes construction of the subgrade and below ground piping and electrical, pump station building, mechanical equipment, HVAC, electrical equipment and power distribution, instrumentation system, generator, radio tower, hydraulic surge control facilities, and all other facilities indicated in the Contract Documents and outlined in these technical specifications.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
5. Bid Item 5: Terminal Tank Site Detention Basin
 - a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install the onsite detention basin, including but not limited to, earthwork, grading, and installation of a basin liner, headwalls, rip rap and rock and all other Work (excluding items included in other bid items) per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - d. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
6. Bid Item 6: Terminal Tank Site Detention Basin Pump Station
 - a. Bid Item Description: Work in this bid item generally includes installation of the detention basin pump station. Work generally includes furnish and install of all mechanical piping, pumps, motors and drives, appurtenances, valves, wet well, vaults and equipment required for the detention basin pump station and all other work (excluding items included in other bid items) necessary to provide a detention basin pump station complete and in place per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
7. Bid Item 7: Traffic Control
 - a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install a complete traffic management system for construction of the terminal tank

site, offsite pipelines, and pressure reducing vaults, including but not limited to changeable message boards, temporary striping, signage, delineators, K-rails, cones, labor, flagmen, temporary fence, and equipment necessary for traffic control, road closure fees, and all other work (excluding items included in other bid items) per the Contract Documents.

- b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
8. Bid Item 8: Subsurface Utility Investigations.
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to complete the utility potholing and other required subsurface utility investigations per Section 02280 - Subsurface Utility Engineering of the Contract Documents. This bid item shall include surface restoration, temporary pavement, and permanent pavement replacement where not included in other bid items.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on each linear foot that has been installed and completed.
9. Bid Item 9: 42-Inch Potable Pipeline.
- a. Bid Item Description: Work in this bid item generally includes installation of 42-inch ductile iron pipe along the offsite pipeline alignment. Work generally includes excavation, saw cutting of existing surfacing, disposal of debris, hand excavation, correction of conflict between new pipeline and utilities, restoration of existing improvements such as irrigation pipe lines and facilities, furnishing and installing piping, bedding, backfill, disposal of excess soil, temporary asphalt resurfacing within trench, compaction, specified testing procedures, and all other work (excluding items included in other bid items) necessary to install the pipe complete and in place per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Linear Foot.
 - c. Payment: Contractor may apply for payment for this Bid Item on each linear foot that has been installed and completed.
10. Bid Item 10: 24-Inch Potable Pipeline.
- a. Bid Item Description: Work in this bid item generally includes installation of 24-inch ductile iron pipe along the offsite pipeline alignment. Work generally includes excavation, saw cutting of existing surfacing, disposal of debris, hand excavation, correction of conflict between new pipeline and utilities, restoration of existing improvements such as irrigation pipe lines and facilities, furnishing and installing piping, bedding, backfill, disposal of excess soil, temporary asphalt resurfacing within trench, compaction, specified testing procedures, and all other work (excluding items included in other bid items) necessary to install the pipe complete and in place per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Linear Foot.
 - c. Payment: Contractor may apply for payment for this Bid Item on each linear foot that has been installed and completed.
11. Bid Item 11: 16-Inch Potable Pipeline.
- a. Bid Item Description: Work in this bid item generally includes installation of 16-inch ductile iron pipe along the offsite pipeline alignment. Work generally includes excavation, saw cutting of existing surfacing, disposal of debris, hand excavation, correction of conflict between new pipeline

- and utilities, restoration of existing improvements such as irrigation pipe lines and facilities, furnishing and installing piping, bedding, backfill, disposal of excess soil, temporary asphalt resurfacing within trench, compaction, specified testing procedures, and all other work (excluding items included in other bid items) necessary to install the pipe complete and in place per the Contract Documents.
- b. Measurement: Measurement for this bid item is by Linear Foot.
 - c. Payment: Contractor may apply for payment for this Bid Item on each linear foot that has been installed and completed.
12. Bid Item 12: Blow-Off Valves.
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install blow-off valves for the offsite pipelines including, but not limited to, earthwork, valve, piping, fittings, valve boxes, all labor, materials, tools and equipment in performing all Work (excluding items included in other bid items) per the Contract Documents. This bid item includes the blow-off valve in the access road on the 54-inch pipeline.
 - b. Measurement: Measurement for this bid item is by Each.
 - c. Payment: Contractor may apply for payment for this Bid Item on each unit that has been installed and completed.
13. Bid Item 13: 3-inch Air Valve Assemblies.
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install 3-inch air valve assemblies along the offsite pipeline alignment, including, but not limited to, earthwork, valve, piping, fittings, valve boxes, all labor, materials, tools and equipment in performing all Work (excluding items included in other bid items) per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Each.
 - c. Payment: Contractor may apply for payment for this Bid Item on each unit that has been installed and completed.
14. Bid Item 14: 8-inch Air Valve Assemblies.
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install 8-inch air valve assemblies along the offsite pipeline alignment, including, but not limited to, earthwork, valve, piping, fittings, valve boxes, all labor, materials, tools and equipment in performing all Work (excluding items included in other bid items) per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Each.
 - c. Payment: Contractor may apply for payment for this Bid Item on each unit that has been installed and completed.
15. Bid Item 15: Inspection Manways.
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install inspection manways along the offsite pipeline alignment (Plan and Profile drawings)^{AD3} including, but not limited to, earthwork, piping, fittings, access manholes, concrete, all labor, materials, tools and equipment in performing all Work (excluding items included in other bid items) per the Contract Documents. This bid item includes the access manway in the access road on the 54-inch pipeline. Inspection manways shown on the Terminal Tank Site - Yard Piping drawings shall be included in Bid Item 2.^{AD3}

- b. Measurement: Measurement for this bid item is by Each.
 - c. Payment: Contractor may apply for payment for this Bid Item on each unit that has been installed and completed.
- 16. Bid Item 16: Potable Pipeline Valves, Connections, and Tie-ins.
 - a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install valves, connections, and tie-ins shown on 10P18 along the offsite pipeline alignment including, but not limited to, earthwork, fittings, slurry cement, all labor, materials, tools and equipment in performing all Work (excluding items included in other bid items) per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
- 17. Bid Item 17: 15-Inch Storm Drain Pipeline.
 - a. Bid Item Description: Work in this bid item generally includes installation of 15-inch PVC pipe along the offsite pipeline alignment shown in the plan and profile drawings including the manhole at approximately STA 528+65. Work generally includes excavation, saw cutting of existing surfacing, disposal of debris, hand excavation, correction of conflict between new pipeline and utilities, restoration of existing improvements such as irrigation pipe lines and facilities, furnishing and installing piping, bedding, backfill, disposal of excess soil, temporary asphalt resurfacing within trench, compaction, specified testing procedures, and all other work (excluding items included in other bid items) necessary to install the pipe complete and in place per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Linear Foot.
 - c. Payment: Contractor may apply for payment for this Bid Item on each linear foot that has been installed and completed.
- 18. Bid Item 18: Storm Drain Pipeline Manholes.
 - a. Bid Item Description: Work in this bid item generally includes installation of storm drain manholes along the offsite pipeline shown in the plan and profile drawings including the manhole at approximately STA 528+65. Work generally includes saw cutting and removal of existing pavement outside of the limits of trenching for the storm drain main, excavation outside the limits of the storm drain main, furnishing and installing cast-in-place concrete manhole base with smooth shaped channels, bedding, backfill, compaction, elevation adjustments, connections to existing storm drain line(s), joint seals, grouting of pipe penetrations, air testing of manholes, and temporary pavement or surfacing, restoration of existing improvements and installation of manhole frames and covers.
 - b. Measurement: Measurement for this bid item is by Each.
 - c. Payment: Contractor may apply for payment for this Bid Item on each unit that has been installed and completed.
- 19. Bid Item 19: Fiber Optic Conduit and Cable.
 - a. Bid Item Description: Work in this bid item generally includes installation of fiber optic conduit and cable along the offsite pipeline alignment as shown in the Drawings. Work generally includes excavation, saw cutting of existing surfacing, disposal of debris, hand excavation, correction of conflict between new fiber optic conduit and utilities, restoration of existing improvements such as irrigation pipe lines and facilities, furnishing and installing conduit, concrete encasement, disposal of excess soil, temporary asphalt resurfacing within trench, compaction, specified testing

- procedures, and all other work (excluding items included in other bid items) necessary to install the conduit complete and in place per the Contract Documents.
- b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
20. Bid Item 20: Fiber Optic Pull Boxes.
- a. Bid Item Description: Work in this bid item generally includes installation of fiber optic pull boxes along the offsite pipeline alignment shown in the plan and profile drawings. Work generally includes saw cutting and removal of existing pavement outside of the limits of trenching for the fiber optic conduit, excavation outside the limits of the fiber optic conduit, furnishing and installing precast fiber optic pull boxes, bedding, backfill, compaction, elevation adjustments, joint seals, grouting of pipe penetrations, temporary pavement or surfacing, restoration of existing improvements and roadway features, including sidewalk, curb and gutter to the standards of the Authority Having Jurisdiction and installation of manhole frames and covers.
 - b. Measurement: Measurement for this bid item is by Each.
 - c. Payment: Contractor may apply for payment for this Bid Item on each unit that has been installed and completed.
21. Bid Item 21: Wellington / East Christofferson Pressure Reducing Vault (PRV).
- a. Bid Item Description: Work in this bid item generally includes all site work, materials, labor, equipment, and all other work required to furnish and install a complete and functional pressure reducing station. This bid item includes excavation, installation, and backfill of the vault structure, mechanical piping, electrical, and instrumentation within the vault and pipe penetrations in the vault walls, including sump drain lines, sitework, paving and grading, site electrical and instrumentation systems, duct banks, electrical connection, power service drop and instrumentation cabinets (excluding item included in other bid items) per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
22. Bid Item 22: East Monte Vista / Brookstone PRV.
- a. Bid Item Description: Work in this bid item generally includes all site work, materials, labor, equipment, and all other work required to furnish and install a complete and functional pressure reducing station. This bid item includes excavation, installation, and backfill of the vault structure, mechanical piping, electrical, and instrumentation within the vault and pipe penetrations in the vault walls, including sump drain lines, sitework, paving and grading, site electrical and instrumentation systems, duct banks, electrical connection, power service drop and instrumentation cabinets (excluding item included in other bid items) per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
23. Bid Item 23: Quincy / Sebastian PRV.
- a. Bid Item Description: Work in this bid item generally includes all site work, materials, labor, equipment, and all other work required to furnish and

install a complete and functional pressure reducing station. This bid item includes excavation, installation, and backfill of the vault structure, mechanical piping, electrical, and instrumentation within the vault and pipe penetrations in the vault walls, including sump drain lines, sitework, paving and grading, site electrical and instrumentation systems, duct banks, electrical connection, power service drop and instrumentation cabinets (excluding item included in other bid items) per the Contract Documents.

- b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
24. Bid Item 24: Stanislaus County Paving — ~~4-inch HMA over 6-inch ABC~~
0.45-foot Asphalt over 0.55-foot ABC^{AD3}.
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install a complete roadway structural section including removing the existing structural section and markings where detailed in the Contract Documents and installing a new aggregate base course and asphalt pavement structural section and all Work (excluding items included in other bid items) required by Stanislaus County and per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Square Yard.
 - c. Payment: Contractor may apply for payment for this Bid Item on each square yard that has been installed and completed.
25. Bid Item 25: Stanislaus County Paving – 2-inch Grind and Overlay.
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install a complete asphalt pavement grind and overlay, where detailed in the Contract Documents including removal of pavement markings, wedge grinds, conform grinds, asphalt concrete, raising existing utilities and monuments to grade, all labor, materials, tools and equipment in performing all Work (excluding items included in other bid items) required by Stanislaus County and per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Square Yard.
 - c. Payment: Contractor may apply for payment for this Bid Item on each square yard that has been installed and completed.
26. Bid Item 26: Stanislaus County Paving – ABC Shoulder.
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install a complete ABC shoulder, where detailed in the Contract Documents including installation of ABC, compaction and all labor, materials, tools and equipment in performing all Work (excluding items included in other bid items) required by Stanislaus County and per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Square Yard.
 - c. Payment: Contractor may apply for payment for this Bid Item on each square yard that has been installed and completed.
27. Bid Item 27: City of Turlock Paving – 2-inch Grind and Overlay.
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install a complete asphalt pavement grind and overlay, where detailed in the Contract Documents including removal of pavement markings, wedge grinds, conform grinds, asphalt concrete, raising existing utilities and

- monuments to grade, all labor, materials, tools and equipment in performing all Work (excluding items included in other bid items) required by the City of Turlock and per the Contract Documents.
- b. Measurement: Measurement for this bid item is by Square Yard.
 - c. Payment: Contractor may apply for payment for this Bid Item on each square yard that has been installed and completed.
28. Bid Item 28: City of Turlock Paving – Pavers.
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install a complete roadway restoration with pavers to match the existing pavers, where detailed in the Contract Documents including removal of pavement markings, wedge grinds, conform grinds, asphalt concrete, raising existing utilities and monuments to grade, all labor, materials, tools and equipment in performing all Work (excluding items included in other bid items) required by the City of Turlock and per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Square Yard.
 - c. Payment: Contractor may apply for payment for this Bid Item on each square yard that has been installed and completed.
29. Bid Item 29: City of Turlock ADA Ramps, Sidewalks, Curb, and Gutter.
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install all ADA ramps, sidewalks, curb, and gutter repairs and replacement and all work (excluding items included in other bid items) required per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
30. Bid Item 30: Pavement Striping.
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install all striping including complete temporary and permanent striping system and all work (excluding items included in other bid items) required per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
31. Bid Item 31: Phase 1 Commissioning
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required for Phase 1 – Pump Station and Terminal Tank Startup to startup and commission the pump station by pumping in a loop to the terminal tank as described in specification 01756.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
32. Bid Item 32: Maintenance of pump station, tank, and all Terminal Tank Site Facilities between Phase 2 Commissioning and Phase 2 Commissioning
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to perform operations and maintenance from Phase 1 Commissioning and Phase 2 Commissioning of the pumps between pump station commissioning and project commissioning per Section 02552.

- b. Measurement: Measurement for this bid item is per Month.
 - c. Payment: Contractor may apply for payment for this Bid Item on each month that has been installed and completed.
33. Bid Item 33: Phase 2 Commissioning
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, temporary pumps, and other activities required to perform the Phase 2 Commissioning per Section 01756 and Section 02554. Work in this bid item includes both parts of Phase 2 Commissioning (Temporary Pumping to the Distribution System and Project Commissioning and Operational Period).
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
34. Bid Item 34: Dust Control.
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to implement a dust control plan to control dust including, but not limited, to sweeping and vacuuming the road, spraying dust control water, covering stockpiled soil with a tarp at all times to prevent generation of fugitive dust, complying with San Joaquin Valley Air Pollution Control District regulations, and all other work (excluding items included in other bid items) per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Payment for this bid item will be made at the Contract unit prices for the quantities determined as specified.
35. Bid Item 35: Dewatering for Trenches and Open Excavations.
- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install a complete dewatering system throughout the entire project, as needed, to control groundwater. Work includes all necessary engineering services, groundwater wells, pumps, piping, sediment removal, temporary power, and other devices required to keep the pipeline trench and other open excavations dewatered during construction. Also included is all permitting, all treatment and disposal costs, installation of dewatering equipment and cost of pumping water and other work (excluding items included in other bid items) per the Contract Documents.
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
36. Bid Item 36: Allowance for Stanislaus County and City of Turlock Encroachment Permit Fees.
- a. Bid Item Description: This bid item includes the fee for the Stanislaus County Encroachment Inspection.
 - b. Measurement: Measurement for this bid item is by Allowance.
 - c. Payment: Payment for this bid item will be for actual cost paid for the Stanislaus County Encroachment Permit (estimated at \$75,000). Markups, staff time, contingencies, and/or any other costs shall not be included. If Contractor elects to close roads, road closure fees shall be included in Bid Item 7.
37. Bid Item 37: Allowance for Turlock Irrigation District New Electrical Service Fees.
- a. Bid Item Description: This bid item includes the fee to establish new electrical services from the Turlock Irrigation District.

- b. Measurement: Measurement for this bid item is by allowance.
- c. Payment: Payment for this bid item will be for actual cost paid for the new electrical services to Turlock Irrigation District (estimated at \$45,000). Markups, staff time, contingencies, and/or any other costs shall not be included. Costs for the ongoing electrical usage after service is established shall be included in Bid Item 1. ^{AD2}

37.38. Bid Item 3738 ^{AD2}: Allowance for Culvert Repairs.

- a. Bid Item Description: This bid item is an allowance for repairing culverts found to be in poor condition that cannot be protected in place. This allowance is not meant for repairing culverts known to exist that are unintentionally damaged by the Contractor.
- b. Measurement: Measurement for this bid item is by Allowance.
- c. Payment: Payment for this bid item will be made based on actual costs of culvert repairs and shall be tracked on a time and material basis. Payment will only be made if specifically authorized in writing by the Construction Manager in advance of the work taking place.

38.39. Bid Item 3839 ^{AD2}: Allowance for Unknown Utilities.

- a. Bid Item Description: This bid item is an allowance for work associated with mitigating the impacts of an unknown utility, such a lowering the pipeline to avoid a conflict with the unknown utility.
- b. Measurement: Measurement for this bid item is by Allowance.
- c. Payment: Payment for this bid item will be made based on actual costs of mitigating the impacts of an unknown utility and shall be tracked on a time and material basis. Payment will only be made if specifically authorized in writing by the Construction Manager in advance of the work taking place.

39.40. Bid Item 3940 ^{AD2}: Allowance for Disputes Review Board per Section 00822.

- a. Bid Item Description: This bid item is an allowance for the Contractor's cost to participate in the Disputes Review Board per Section 00822.
- b. Measurement: Measurement for this bid item is by Allowance.
- c. Payment: Payment for this bid item will be made based on actual costs of participating in the Disputes Review Board and shall be tracked on a time and material basis. Payment will only be made if the Disputes Review Board is used and specifically authorized in writing by the Construction Manager in advance of the work taking place.

40.41. Bid Item 4041 ^{AD2}: Allowance for Project Partnering per Section 01305.

- a. Bid Item Description: Work in this bid item generally includes all materials, equipment, locations, food and drink, and other activities for a professional facilitator to facilitate and participate in project partnering sessions per Section 01305. Contractor and subcontractor labor to participate in Project Partnering is not reimbursable in this bid item.
- b. Measurement: Measurement for this bid item is by Allowance.
- c. Payment: Payment for this bid item will be made based on actual costs paid to the facilitator and the facilitation location, food, and drink.

41.42. Bid Item 4142 ^{AD2}: Sheeting, Shoring, and Bracing, or Equivalent Method for the Protection of Life and Limb in Trenches and Open Excavation, Pursuant to California Labor Code §6707 and Section 02260.

- a. Bid Item Description: Work in this bid item generally includes all materials, labor, equipment, and other activities required to furnish and install all temporary sheeting, shoring, and bracing for excavations and grading required per the Contract Documents including, but not limited to, geotechnical investigations, engineering, permits, materials, tools, labor, and equipment necessary to perform the Work.

- b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed.
- ~~42-43~~ Bid Item ~~4243~~^{AD2}: All other work required to complete the project that is not Included in Bid Items 1 - ~~4142~~^{AD2}.
- a. Bid Item Description: Work in this bid item generally includes all work needed to complete the project that is not specifically included in other Bid Items. This bid item is intended to provide a location for miscellaneous work required to complete the project that is not covered by any other bid item. Work in this bid item shall include all materials, labor, equipment, and other activities required to furnish and install a complete cathodic protection system including, but not limited to pipeline bonding, rectifiers, deep well anode beds, electrical power service drops, and monitoring stations and performing all work (excluding items included in other bid items) per the Contract Documents.^{AD3}
 - b. Measurement: Measurement for this bid item is by Lump Sum.
 - c. Payment: Contractor may apply for payment for this Bid Item on a percent complete basis as it is being completed and in accordance with the detail required to be listed in Section 01292.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

^{AD3} Addendum No. 3

^{AD2} Addendum No. 2

SECTION 01460
CONTRACTOR QUALITY CONTROL PLAN

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Contractor Quality Control Plan.

1.02 SUBMITTALS

- A. Qualifications of the Contractor's Quality Control (CQC) Plan Manager.
- B. Contractor's Daily Quality Control Report: Submit to Construction Manager within 1 day of completion of each inspection.
- C. Daily Inspection Report: Submit to Construction Manager at the end of each working day or no later than prior to the beginning of the next working day.

1.03 CONTRACTOR'S INSPECTION OF THE WORK

- A. Work performed by Contractor shall be inspected by the Contractor's CQC Plan Manager. Non-conforming Work and any safety hazards in the Work area shall be noted and promptly corrected.
- B. No materials or equipment shall be used in Work without inspection and acceptance by Contractor's CQC Plan Manager.

1.04 QUALIFICATIONS

- A. Contractor's CQC Plan Manager: Demonstrate having performed similar CQC functions on similar type projects. Submit records of personnel experience, training, and qualifying registrations.
- B. Minimum qualifications: Candidate must have a minimum of 10 years of experience on projects of similar type and size.

1.05 COVERING WORK

- A. Whenever Contractor intends to backfill, bury, cast in concrete, or otherwise cover any Work, notify Construction Manager not less than 24 hours in advance to request inspection before beginning any such Work of covering. Failure of Contractor to notify Construction Manager in accordance with this requirement shall be resolved according to Article 14 of the General Conditions.

1.06 CONTRACTOR'S QUALITY CONTROL PROGRAM

- A. General: Establish and execute a Quality Control (CQC) Plan for Work. The plan shall establish adequate measures for verification and conformance to defined

requirements by Contractor personnel and lower-tier Subcontractors (including Fabricators, Suppliers, and Subcontractors). This program shall be described in a Plan responsive to this Section.

B. CQC personnel:

1. Contractor's CQC Plan Manager shall report to a Senior Project Manager of the Contractor ~~and shall have no supervisory or managerial responsibility over the workforce. The CQC may be the Contractor's Project Engineer or Superintendent.~~^{AD3}
2. The Contractor CQC Plan Manager shall be on-site as often as necessary, but not less than the daily working hours specified in the Contract Documents to remedy and demonstrate that Work is being performed properly and to make multiple observations of Work in progress.
3. The Contractor is to furnish personnel with assigned CQC functions reporting to the CQC Manager. Persons performing CQC functions shall have sufficient qualifications, authority, and organizational freedom to identify quality problems and to initiate and recommend solutions.

C. CQC Plan:

1. Contractor's CQC Plan shall include a statement by the Senior Project Manager designating the CQC Plan Manager and specifying the authority delegated to the CQC Plan Manager to direct cessation or removal and replacement of defective Work.
2. Describe the CQC program and include procedures, work instructions, and records. Describe methods relating to areas that require special testing and procedures as required by the specifications.
3. Include specific instructions defining procedures for observing Work in process and comparing this Work with the Contract requirements (organized by specifications section).
4. Describe procedures to ensure that equipment or materials that have been accepted at the Site are properly stored, identified, installed and tested.
5. Include procedures to verify that procured products and services conform to the requirements of the Specifications. Requirements of these procedures shall be applied, as appropriate, to lower-tier Suppliers and/or Subcontractors.
6. Commissioning quality control: Include procedures to verify that the commissioning requirements of the Contract Documents are integrated into the Contractor's CQC Plan and conform to the requirements of the Specifications. Requirements of these procedures shall be applied, as appropriate, to the Contractor and the lower-tier Suppliers and/or Subcontractors.
7. Include instructions for recording inspections and requirements for demonstrating through the Daily Inspection Reports that Work inspected was in compliance or a deficiency was noted and action to be taken.
8. Procedures to preclude the covering of deficient or rejected Work.
9. Procedures for halting or rejecting Work.
10. Procedures for resolution of differences between the CQC Plan Manager and the production personnel.
11. Identify contractual hold/inspection points as well as any Contractor-imposed hold/inspection points.

D. Daily Inspection Report: Include, at a minimum:

1. Inspection of specific work.

2. Quality characteristics in compliance.
 3. Quality characteristics not in compliance.
 4. Corrective/remedial actions taken.
 5. Statement of certification.
 6. CQC Manager's signature.
 7. Information provided on the daily report shall not constitute notice of delay or any other notice required by the Contract Documents.
- E. Deficient and Non-conforming Work and Corrective Action: Include procedures for handling deficiencies and non-conforming Work. Deficiencies and non-conforming Work are defined as documentation, drawings, material, equipment, or Work not conforming to the indicated requirements or procedures. The procedure shall prevent non-conformances by identification, documentation, evaluation, separation, disposition, and corrective action to prevent reoccurrence. Conditions having adverse effects on quality shall be promptly identified and reported to the senior level management. The cause of conditions adverse to quality shall be determined and documents and measures implemented to prevent recurrence. In addition, at a minimum, this procedure shall address:
1. Personnel responsible for identifying deficient and non-complying items within Work.
 2. How and by whom deficient and non-compliant items are documented "in the field."
 3. The personnel and process utilized for logging deficient and non-compliant Work at the end of each day onto a deficiency log.
 4. Tracking processes and tracking documentation for deficient and non-conforming Work.
 5. Personnel responsible for achieving resolution of outstanding deficiencies.
 6. Include detailed procedures for the performance and control of special process (e.g., welding, soldering, heat treating, cleaning, plating, nondestructive examination, etc.).
- F. Audits: The CQC program shall provide for regularly scheduled documented audits to verify that CQC procedures are being fully implemented by Contractor and its Subcontractors. Audit records shall be made available to Construction Manager upon request.
- G. Documented control/quality records:
1. Establish methods for control of Contract Documents that describe how Drawings and Specifications are received and distributed to ensure the correct issue of the document being used. Describe how record document/drawing data are documented and furnished to Construction Manager.
 2. Maintain evidence of activities affecting quality. Including operating logs, records of inspection, audit reports, personnel qualification and certification records, procedures, and document review records.
 3. Maintain quality records in a manner that provides for timely retrieval and traceability. Protect quality records from deterioration, damage and destruction.
 4. Develop a list of specific records as required by the Contract Documents that will be furnished to Construction Manager and Engineer at the completion of activities.

- H. Acceptance of CQC Plan: Construction Manager's acceptance of the CQC Plan shall not relieve Contractor from any of its obligations for performance of Work. Contractor's CQC staffing is subject to Construction Manager's review and continued acceptance. Owner, at its sole discretion, and without cause, may direct Contractor to remove and replace the CQC Plan Manager.
1. Acceptance of the CQC Plan by the Construction Manager is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction.
 2. After acceptance of the CQC Plan, notify the Construction Manager in writing of any proposed change. Proposed changes are subject to acceptance by the Construction Manager.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

^{AD3} Addendum No. 3

SECTION 01756
COMMISSIONING
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PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Requirements for each Commissioning Phase of the Project equipment/system and/or facility. Commissioning generally consists of the following:
 - 1. Planning Phase.
 - 2. Testing and Training Phase.
 - 3. Complete all milestones defined in specification 00520.
 - 4. Phase 1 Commissioning.
 - 5. Maintenance of pump station, tank, and all Terminal Tank Site facilities between Phase 1 and Phase 2 Commissioning.
 - 6. Phase 2 Commissioning.
 - 7. Final completion.
- B. Contractor shall refer to specification 00520 for all interim milestones. The Contractor shall complete construction and commissioning of the following Project facilities by January 1, 2023 to allow SRWA to perform startup and testing of the SRWA finished water pump station, SRWA control room located at the terminal tank site, and SRWA SCADA tower and SCADA system located at the terminal tank site:
 - 1. Terminal tank and all ancillary facilities (influent piping, drain piping, and tank instrumentation/controls).
 - 2. Electrical building.
 - 3. SRWA control room and finish wiring.
 - 4. SCADA system.
 - 5. Storm drain basin, pump station, and pipeline.
- C. Contractor shall complete Phase 1 Commissioning by March 1, 2023. The Contractor shall fully test the pump station by pumping to the terminal tank as required by the specifications and shown in the Drawings.
- D. The Contractor shall perform maintenance on the pump station, tank, and all Terminal Tank Site Facilities as required by Section 02554. The maintenance shall maintain the manufacturer's warranty and be performed between Phase 1 Commissioning and Phase 2 Commissioning.
- E. Contractor shall begin Phase 2 Commissioning when potable water is delivered from Stanislaus Regional Water Authority (SRWA) through the SRWA transmission pipeline to the Terminal Tank Site.
 - 1. For bidding purposes, Contractor shall assume treated water that meets DDW requirements will be pumped from the SRWA WTP to the terminal tank on April 15, 2023.
 - 2. Delivery of water to the City's distribution system in Phase 2 Commissioning shall commence at the same time SRWA delivers potable water.

1.02 DEFINITIONS

- A. Clean Water Facility Testing - Testing of complete facility utilizing clean water for purposes of confirming extended equipment/system operation prior to Process Start-up Phase.
- B. Commissioning - The process of planning, testing, and process start-up of the installation for compliance with contract requirements and demonstrating, through

documented verification, that the project has successfully met the Contractual requirements. It includes training the Owner's staff to operate the facility.

- C. Commissioning Phases - The work activities of facility commissioning are grouped into the phases defined in the table below.

<u>Commissioning</u>		
<u>Planning Phase</u>	<u>Testing and Training Phase</u>	<u>Process Start-Up Phase</u>
Owner Training Plan and Schedule	Source Testing	Process Start-up
Commissioning Schedule	Owner Training	Process Operational Period
Subsystem Testing Plan	Installation Testing	PCIS Optimization and Fine-Tuning
Clean Water Facility Testing Plan	Functional Testing	
	Clean Water Facility Testing	
	Closeout Documentation	

- D. Component - A basic building block of equipment, subsystems, and systems that requires installation or functional testing but does not have an electrical connection or internal electronics. (Examples: pump Station suction piping and manual isolation valves).
- E. Device - A basic building block of equipment, subsystems, and systems that requires installation or functional testing and does have an electrical connection or internal electronics. (Examples: tank level transmitter or water pump pressure transmitter).
- F. Equipment - An assembly of component(s) and devices(s) that requires installation or functional testing. (Examples: Pump, motor, VFD, etc.).
- G. Facility - A grouping of process areas, systems, subsystems, equipment, components, and devices (Examples: pump station, etc.).
- H. Functional Testing - Testing performed on a completed subsystem to demonstrate that equipment/system meets manufacturers' calibration and adjustment requirements and other requirements as specified. Functional testing includes operating equipment/system manually in local, manually in remote (or remote manual), and automatically in remote (in remote auto).
- I. Installation Testing - Testing to demonstrate that subsystem component (piping, power, networks, devices, etc.) is ready and meets the project requirements in advance of functional testing. Installation testing also includes manufacturers' certification of installation and other requirements as specified to prepare equipment/system for Functional Testing. Also referred to as Field Acceptance Testing.

- J. Manufacturer's Certificate of Source Testing - When applicable, the form is used during Source Testing for the manufacturer to confirm that the applicable source tests have been performed and results conform to the Contract Documents. The form is provided at the end of this Section.
- K. Manufacturer's Certificate of Installation and Functionality Compliance - The form is used during Installation Testing and Functional Testing. It is submitted at the end of Functional Testing to confirm that the equipment/system is installed in conformance with the Contract Documents and that it meets the Functional Testing requirements defined in the Contract Documents. The form is provided at the end of this Section.
- L. PCIS Optimization and Fine-Tuning - Test and adjust the entire process control system under standard operating conditions.
- M. Product - A system, subsystem or component.
- N. Subsystem - A building block of systems made up from a grouping of components, devices, and equipment that perform a definable function.
- O. System - A grouping of subsystems, equipment, components, and devices that perform a definable function. (Examples: Filter No. 1, Sedimentation Basin).

1.03 SUBMITTALS

- A. Qualifications:
 - 1. Commissioning Coordinator's qualifications.
 - 2. Manufacturer's representative's qualifications.
- B. Schedules:
 - 1. Owner Training Plan Schedule.
 - 2. Commissioning Schedule.
- C. Certificates:
 - 1. Manufacturer's Certificate of Source Testing.
 - 2. Manufacturer's Certificate of Installation and Functionality Compliance.
- D. Reports:
 - 1. Test reports.
- E. Plans:
 - 1. Owner Training Plan.
 - 2. Source Test Plan.
 - 3. Installation and Functional Testing Plan.
 - a. Subsystem Testing Plans.
 - 4. Clean Water Facility Testing Plan.
 - 5. Process Start-Up Plan.
 - a. Process Start-Up.
 - b. Process Operational Period.
 - c. PCIS Optimization and Fine-Tuning.
 - 6. Final Operational Testing Plan.
- F. Documentation:
 - 1. Preliminary documentation.

2. Final documentation.
3. Closeout documentation.

1.04 COMMISSIONING COORDINATOR (CC)

- A. Designate and provide a CC for this project.
 1. Submit summary of the CC's qualifications within 30 days of NTP:
 - a. Include description of previous experience as a CC on similar projects for the designated CC with a list of references including phone numbers for review and Owner approval.
 2. The CC must have minimum of 10 years of experience in similar construction projects.
- B. CC responsibilities include the following:
 1. Lead efforts relating to Commissioning.
 2. Be thoroughly familiar with commissioning requirements in the Contract Documents.
 3. Be regularly engaged and experienced in all aspects of commissioning.
 4. Provide technical instruction for commissioning.
 5. Provide primary interface with Engineer and Owner for efforts relating to Commissioning of Project facilities.
 6. Coordinate training efforts.
- C. Designate and provide CC assistants, as needed.

1.05 SERVICES OF MANUFACTURER'S REPRESENTATIVES

- A. Qualification of manufacturer's representative as specified in the Contract Documents technical sections include the following:
 1. Authorized representative of the manufacturer, factory trained and experienced in the technical applications, installation, operation, and maintenance of respective equipment/system with full authority by the equipment/system manufacturer to issue the certifications required of the manufacturer.
 2. Competent, experienced technical representative of equipment/system manufacturer for assembly, installation, testing guidance, and training.
 3. Additional qualifications may be specified in the individual sections.
 4. Submit qualifications of the manufacturer's representative no later than 30 days in advance of required observations.
 5. Representative subject to approval by Owner, Construction Manager and Engineer.
 6. No substitute representatives will be allowed until written approval by Owner, Construction Manager and Engineer has been obtained.
- B. Completion of manufacturer on-site services: Engineer or Construction Manager approval required.
- C. Manufacturer is responsible for determining the time required to perform the specified services.
 1. Minimum times specified in the Contract Documents are estimates.

2. No additional costs associated with performing the required services will be approved.
 3. Manufacturer required to schedule services in accordance with the Contractor's project schedule up to and including making multiple trips to project site when there are separate milestones associated with installation of each occurrence of manufacturer's equipment.
- D. Manufacturer's on-site services as specified in the Contract Documents include the following:
1. Assistance during Commissioning Phase and Process Start-Up Phase.
 2. Other requirements as specified in the Contract Documents.

1.06 PLANNING PHASE

- A. Overview of Planning Phase:
1. Define approach and timing for Commissioning.
- B. Owner training plan and schedule:
1. Training outcomes:
 - a. Owner's operations, maintenance, and engineering staff have the information needed to safely operate, maintain, and repair the equipment/systems provided in the Contract Documents.
 2. Training objectives:
 - a. To instruct personnel in the operation and maintenance of the equipment/system. Instruction shall include step-by-step troubleshooting procedures with all necessary test equipment/system.
 - b. To instruct personnel in the removal, inspection, and cleaning of equipment/system as needed.
 - c. Training tailored to the skills and job classifications of the staff attending the classes (e.g., plant superintendent, treatment plant operator, maintenance technician, electrician, etc.).
 - d. Provide supporting documentation, such as vendor operation and maintenance manuals.
 3. Training schedule:
 - a. Schedule Owner's staff training within the constraints of their workloads. Those who will participate in this training have existing full-time work assignments, and training is an additional assigned work task, therefore, scheduling is imperative. Owner staff work schedules regularly shift, as treatment facilities are typically operated on an around-the-clock basis.
 4. Training plan:
 - a. Coordinate and arrange for manufacturer's representatives to provide both classroom-based learning and field (hands-on) training, based on training module content and stated learning objectives.
 - b. Conduct classroom training at location designated by Owner.
 - c. Scope and sequence:
 - 1) Plan and schedule training in the correct sequence to provide prerequisite knowledge and skills to trainees.
 - 1) Describe recommended procedures to check/test equipment/system following a corrective maintenance repair.

5. Training scheduling coordination:
 - a. CC is responsible for the following:
 - 1) Coordinate schedule for training periods with the Owner's personnel and manufacturer's representatives (instructors).
 - b. Complete Owner training no sooner than 15 calendar days prior to start of process start-up of each system.
6. Meetings:
 - a. CC is responsible for setting commissioning coordination meeting dates and times, as well as preparing the agendas and meeting minutes.
 - b. CC shall meet with Construction Manager, Engineer and Owner's designated training coordinator to develop list of personnel to be trained and to establish expected training outcomes and objectives at least 60 calendar days prior to commissioning of equipment/system.
 - c. CC shall conduct commissioning progress meetings throughout construction, to plan, scope, coordinate, and schedule future activities, resolve problems, etc.
 - 1) Frequency: Monthly minimum. Increase frequency as needed based on complexity and quantity of commissioning activities.
7. Submittals:
 - a. Submit Training Plan Schedule 30 calendar days before the first scheduled training session, including but not limited to lesson plans, participant materials, instructor's resumes, and training delivery schedules.
 - b. Submit training documentation including the following:
 - 1) Training plan:
 - 1) Training modules.
 - 2) Scope and sequence statement.
 - 3) Contact information for manufacturer's instructors including name, phone, and e-mail address.
 - 4) Instructor qualifications.
 - 2) Training program schedule:
 - 1) Format: Bar chart:
 - a) Additionally, include in the Project Progress Schedule.
 - 2) Contents:
 - a) Training modules and classes.
8. Training sessions:
 - a. Provide training sessions for equipment/system as specified in the individual equipment/system section.

C. Commissioning Schedule:

1. Commissioning overview:
 - a. Comply with Commissioning Roles and Responsibilities Matrix specified at the end of this Section.
2. Submittal due date:
 - a. Submit Commissioning Schedule not less than 90 calendar days prior to planned initial commissioning of each subsystem or system.
3. Schedule requirements:
 - a. Schedule durations and float for commissioning activities to ensure Work does not fall behind schedule due to complications or delays during commissioning.
 - b. Time-scaled network diagram detailing the work to take place in the period between 90 calendar days prior to planned initial commissioning of

equipment and systems, and prior to the date of Substantial Completion, together with supporting narrative.

- c. Provide detailed schedule of commissioning activities including durations and sequencing requirements.
 - 1) Identify the following activities:
 - 1) Testing and Training Phase:
 - a) Source Testing.
 - b) Owner Training.
 - c) Installation Testing.
 - d) Functional Testing.
 - e) Clean Water Facility Testing.
 - f) Closeout Documentation.
 - 2) Process Start-Up Phase:
 - a) Process Start-Up.
 - b) Process Operational Period.
 - c) PCIS Optimization and Fine-Tuning.
- d. Schedule manufacturer's services to avoid conflict with other on-site testing or other manufacturers' on-site services.
- e. Verify that conditions necessary to allow successful testing have been met before scheduling services.

D. Installation and Functional Testing Plan:

- 1. Submit Installation and Functional Testing Plan.
- 2. Subsystem testing plans:
 - a. Submit separate testing plans for each individual subsystem and system that include the following:
 - 1) Approach to testing including procedures, schedule, and recirculation requirements.
 - 2) Test objective: Demonstrate subsystem meets the design requirements as specified in the technical sections.
 - 3) Test descriptions, forms, temporary systems (pumps, piping, etc.), shutdown requirements for existing systems, test forms, test logs, witness forms, and checklists to be used to control and document the required tests.
 - 4) Test forms: Include, but not limited to, the following information:
 - 1) Tag and name of equipment/system to be tested.
 - 2) Test date.
 - 3) Names of persons conducting the test.
 - 4) Names of persons witnessing the test, where applicable.
 - 5) Test data.
 - 6) Applicable project requirements.
 - 7) Check offs for each completed test or test step.
 - 8) Place for signature of person conducting tests and for the witnessing person, as applicable.
 - 5) Define start-up sequencing of unit processes:
 - 1) Include testing of alarms, interlocks, permissives, control circuits, capacities, speeds, flows, pressures, vibrations, sound levels, and other parameters.
 - 2) Provide detailed test procedures setting forth step-by-step descriptions of the procedures for systematic testing of equipment/system.

- 3) Demonstrate proper rotation, alignment, speed, flow, pressure, vibration, sound level, adjustments, and calibration.
 - a) Perform initial checks in the presence of and with the assistance of the manufacturer's representative.
- 4) Demonstrate proper operation of each control loop function including mechanical, electrical, alarms, local and remote controls, instrumentation, and other equipment/system functions.
 - a) Generate signals with test equipment/system to simulate operating conditions in each control mode.
- b. Engineer and Construction Manager approval of test plan is required prior to performing test.
 - 1) Revise and update test plans based on review comments, actual progress, or to accommodate changes in the sequence of activities.
 - 2) Submit test reports for each phase of testing for each equipment/system.
 - 3) Engineer and Construction Manager approval of preceding test reports is required prior to start of next test.
 - 4) Tests will be rescheduled if test plan is not approved by the required deadline.
 - 1) Contractor is responsible for any resulting delay.
- c. Contractor is responsible to reproduce and distribute final test procedures.
 - 1) Provide 3 copies for Engineer and Construction Manager.
- d. Tests may commence only after Engineer and Construction Manager has received approved test plan copies.
- e. Submittals:
 - 1) Submit test plans not less than 90 calendar days prior to planned installation testing of subsystem or system.
 - 2) Completed Manufacturer's Certificate of Installation and Functionality Compliance.
 - 3) Test procedures and forms: Provide signed-off copy of test forms and test reports upon completion of the test.
 - 4) Test reports:
 - 1) Submit preliminary copies within 1 day after testing completion.
 - 2) Submit final copies and report within 14 days after testing completion.

E. Clean Water Facility Testing Plan:

1. Submit a Clean Water Facility Testing Plan equivalent to the requirements of the subsystem test plans a minimum of 90 calendar days prior to Clean Water Facility Testing.

1.07 TESTING AND TRAINING PHASE

A. Overview of Testing and Training Phase:

1. General:
 - a. Include specified Source Testing, Owner Training, Installation Testing, Functional Testing, Clean Water Facility Testing, and Closeout Documentation required by this Section and the technical sections.

2. Contractor responsibilities:
 - a. Furnish labor, power, chemicals, tools, equipment, instruments, and services required for and incidental to completing commissioning activities in accordance with the approved Commissioning Plans.
 - b. Prior to testing, verify equipment protective devices and safety devices have been installed, calibrated, and tested.
 - c. Acceptable tests: Demonstrate the equipment/system performance meets the requirements stated in the Contract Documents.
 - 1) When the equipment/system fails to meet the specified requirements, perform additional, more detailed, testing to determine the cause, correct, repair, or replace the causative components and repeat the testing that revealed the deficiency.
- B. Source testing:
 1. Also referred to as factory testing or factory acceptance testing (FAT).
 2. Test components, devices, and equipment/system for proper performance at point of manufacture or assembly as specified in the technical sections.
 3. Notify the Engineer in writing when the equipment/system is ready for source inspection and testing.
 4. Source Test Plan:
 - a. As specified in this Section and other technical sections.
 - b. Source testing requirements as specified in technical sections.
 - 1) Non-witnessed: Provide Manufacturer's Certificate of Source Testing.
 - 2) Witnessed: 1 Owner's representative and 1 Engineer's representative present during testing, unless otherwise specified, and provide Manufacturer's Certificate of Source Testing.
 - c. Prepared by Contractor as a result of discussions and planning emerging from regularly conducted commissioning meetings for source tests as specified in the Contract Documents.
 - d. Provide the following items for each Source Test:
 - 1) Purpose and goals of the test.
 - 2) Identification of each item of equipment/system, including system designation, location, tag number, control loop identifier, etc.
 - 3) Description of the pass/fail criteria that will be used.
 - 4) Listing of pertinent reference documents (Contract Documents and industry standards or sections applicable to the testing).
 - 5) Complete description, including drawings or photographs, of test stands and/or test apparatus.
 - 6) Credentials of test personnel.
 - 7) Descriptions of test equipment to be used, product information, and all appropriate calibration records for the test equipment.
 - 8) Test set-up procedures.
 - 9) Detailed step-by-step test procedures.
 - 1) The level of detail shall be sufficient for any witness with a rudimentary technical aptitude to be able to follow the steps and develop confidence that the tests were being performed as planned.
 - 2) All steps are significant, and all steps shall be included in the procedures.
 - 10) Sample data logs and data recording forms.

- 11) Sample computations or analyses with the results in the same format as the final report to demonstrate how data collected will be used to generate final results.
 - 1) Complete disclosure of the calculation methodologies.
 - 2) Include a sample for each type of computation required for the test and analysis of the results.
 - 12) Detailed outline of the Source Test report.
 - 13) Sample test reports.
 - e. Submit Source Test Plan and forms as specified in the technical sections.
 - 1) Submit a copy of the Source Test Plan at least 21 days before any scheduled test date.
 - 2) Engineer approval of Source Test Plan required prior to beginning source testing.
 - 3) Schedule the testing after approval of the Source Test Plan submittal.
 - f. Indicate the desired dates for source inspection and testing.
 - 1) Notify the Engineer and Construction Manager of the scheduled tests a minimum of 15 days before the date of the test.
 5. Test results:
 - a. Prepare and submit test results with collected data attached.
 6. Contractor is responsible for costs associated with Owner's and Engineer's representatives when witnessing is specified. See Section 01600 for requirements.^{AD2}
 - ~~a. Include costs for at least the following:~~
 - ~~1) Transportation:~~
 - ~~1) Travel on commercial airline to and from site including related fees.~~
 - ~~2) Rental car to and from airport, hotel, and test site including related fees.~~
 - ~~2) Hotel/Meals:~~
 - ~~1) Hotel costs at a facility with an American Automobile Association 3-star rating or higher equivalent for single occupancy room per person per day.~~
 - ~~2) Meal allowance based on government per diem guidelines per location.~~
 - ~~3) Witness labor costs:~~
 - ~~1) The greater of \$200 per hour or \$1,600 per day.~~^{AD2}
 - ~~b.a.~~ If Source Test is not ready when the witnesses arrive or if the Source Test fails, the witnesses will return home with Contractor responsible for costs associated with the trip including costs described above.
 - 1) Contractor is responsible for rescheduling the Source Test and witnesses' costs associated with the second trip including costs described above.
 7. Contractor is responsible for witnesses' costs associated with retests including costs described above.
- C. Owner training:
1. Training instruction format:
 - a. The training for operations and maintenance personnel shall be provided as one entity.
 - b. Instructors shall apply adult education best practices, emphasizing learner participation and activity.

- c. Training delivery may include problem solving, question/answer, hands-on instruction, practice, evaluation/feedback tools, and lecture.
 - d. Visual aids and hands-on practice sessions must support training objectives.
 - e. Lecturing should be less than 30 percent of class time.
 - f. Conduct hands-on instruction according to the following descriptions:
 - 1) Present hands-on demonstrations of at least the following tasks:
 - 1) Proper start-up, shutdown, and normal and alternative operating strategies.
 - 2) Common corrective maintenance repairs for each group.
 - 3) Recommended procedures to check/test equipment/system following a corrective maintenance repair.
 - 4) Preventative maintenance points.
 - 5) Calibration, if applicable.
 - 2) Use tools and equipment provided by manufacturer to conduct the demonstrations.
 - 1) Submit requests for supplemental assistance and facilities with the Contractor's proposed lesson plans.
 - 3) Contractor remains responsible for equipment disassembly or assembly during hands-on training situations involving equipment disassembly or assembly by Owner's personnel.
2. Class agenda:
- a. Include the following information in the agenda:
 - 1) Instructor name.
 - 2) Listing of subjects to be discussed.
 - 3) Time estimated for each subject.
 - 4) Allocation of time for Owner staff to ask questions and discuss the subject matter.
 - 5) List of documentation to be used or provided to support training.
 - b. Owner may request that particular subjects be emphasized and the agenda be adjusted to accommodate these requests.
 - c. Distribute copies of the agenda to each student at the beginning of each training class.
3. Number of students:
- a. Estimated maximum class size: 10 persons.
 - 1) Owner will determine the actual number of students.
 - 2) Construction Manager will provide an estimated headcount 1 week prior to the class, so that the instructor can provide the correct number of training aids for students.
4. Instructor qualifications:
- a. Provide instructors completely knowledgeable in the equipment/system for which they are training.
 - b. Provide instructors experienced in conducting classes.
 - c. Provide instructor's technical preparation and instructional technology skills and experience.
 - d. Sales representatives are not qualified instructors unless they possess the detailed operating and maintenance knowledge required for proper class instruction.
 - e. If, in the opinion of the Owner, an appropriately knowledgeable person did not provide the scheduled training, such training shall be rescheduled and repeated with a suitable instructor.

5. Training aids:
 - a. Instructors are encouraged to use audio-visual devices, P&IDs, models, charts, etc. to increase the transfer of knowledge.
 - b. Instructors shall provide such equipment (televisions, video recorder/player, computer, projectors, screens, easels, etc.), models, charts, etc. for each class.
 - c. Instructor is responsible for confirming with Construction Manager and Owner in advance of each class that the classroom will be appropriate for the types of audiovisual equipment to be employed.
6. Classroom documentation:
 - a. Trainees will keep training materials and documentation after the session.
 - b. Operations and maintenance manuals, as specified in technical sections:
 - 1) Provide the quantity final Engineer-approved operations and maintenance manuals as specified in Section 01782 - Operation and Maintenance Manuals for use during the classroom instruction.
 - 2) Owner reserves the right to delay training for a particular equipment item if the operations and maintenance manuals for that equipment are incomplete, inaccurate, or otherwise unsuitable for use by the Owner's staff.
 - 3) No contract extensions or extra costs will be allowed for training delays due to operations and maintenance manual submittal delays.
 - c. Provide supplemental documentation handouts to support instruction.
 - d. Digitally record audio and video of each training session.
 - 1) Include classroom and field instruction with question and answering periods.
 - 2) Construction Manager approval required for producer of video materials from one of the following options:
 - 1) Qualified, professional video production company.
 - 2) Contractor demonstrates satisfactory skill.
 - 3) Record in digital format and recording shall become property of the Owner.
 - 1) Provide audio quality that is not degraded during the recording of the field sessions due to background noise, space, distance or other factors.
 - 4) Video files shall be file format and delivery medium as directed and approved by Owner.
 - 5) Provide 2 complete sets of video materials fully indexed and cataloged with printed labels stating session content and dates recorded.
 - 6) The Contractor shall provide a written release from all claims to the recorded training material produced, if required.
 - e. Training modules:
 - 1) Provide a training module for each equipment category.
 - 2) Divide each training module's instructional content into discrete lesson plans.
 - f. Lesson plans:
 - 1) Provide performance-based learning objectives.
 - 2) State learning objectives in terms of what the trainees will be able to do at the end of the lesson.
 - 3) Define student conditions of performance and criteria for evaluating instructional success.

- 4) Instruction lesson plan outlines for each trade.
 - 1) Provide specific components and procedures.
- 5) Minimum requirements:
 - 1) Hands-on demonstrations planned for the instructions.
 - 2) Cross-reference training aids.
 - 3) Planned training strategies such as whiteboard work, instructor questions, and discussion points or other planned classroom or field strategies.
 - 4) Attach handouts cross-referenced by section or topic in the lesson plan.
 - 5) Indicate duration of outlined training segments.
- 6) Provide maintenance instruction lesson plans including mechanical, HVAC, instrumentation, and electrical aspects:
 - 1) Equipment operation:
 - a) Describe equipment's operating (process) function and system theory.
 - b) Describe equipment's fundamental operating principles and dynamics.
 - c) Identify equipment's mechanical, electrical, and electronic components and features.
 - d) Identify support equipment associated with the operation of subject equipment.
 - e) Detail the relationship of each piece of equipment or component to the subsystems, systems, and process.
 - f) Cite hazards associated with the operations, exposure to chemicals associated with the component, or the waste stream handled by the component.
 - g) Specify appropriate safety precautions, equipment, and procedures to eliminate, reduce, or overcome hazards.
 - 2) Detailed component description:
 - a) Define Preventative Maintenance (PM) inspection procedures required on equipment in operation, spot potential trouble symptoms (anticipate breakdowns), and forecast maintenance requirements (predictive maintenance).
 - (a) Review preventive maintenance frequency and task analysis table.
 - b) Identify each component function and describe in detail.
 - c) Where applicable, group relative components into subsystems.
 - d) Identify and describe in detail equipment safety features, permissive and controls interlocks.
- 7) Provide the following information in equipment troubleshooting lesson plans:
 - 1) Define recommended systematic troubleshooting procedures as they relate to specific craft problems.
 - 2) Provide component specific troubleshooting checklists as they relate to specific craft problems.
- 8) Provide the following information in equipment Corrective Maintenance (CM) troubleshooting lesson:
 - 1) Describe recommended equipment preparation requirements as they relate to specific craft problems.

- 2) Identify and describe the use of any special tools required for maintenance of the equipment as they relate to specific craft problems.
 - 3) Describe component removal/installation and disassembly/assembly procedures for specific craft repairs.
 - 4) Perform at least 2 hands-on demonstrations of common corrective maintenance repairs.
 - a) Additional demonstrations may be required by the Owner.
 - 5) Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.
7. Class logistics:
- a. Delivery time minimum: 2 hours.
 - b. Delivery time maximum: 4 hours.
 - 1) Longer time requires Engineer approval.
 - c. Class agenda:
 - 1) Refreshment break: One 10-minute break.
 - 2) Meal break: One 45-minute break, unless otherwise specified.
 - 3) Schedule refreshment breaks and meal breaks to meet the class needs and Owner work rules.
 - d. Schedule specific sessions:
 - 1) Minimum of 30 days in advance to allow Owner staffing arrangements to take place.
 - 2) At the times requested by the Owner, within the period 7 a.m. to 7 p.m. Monday through Friday.
 - 1) Times scheduled will be at Owner's discretion.
 - 3) Owner approval and confirmation required for session schedules.
 - 4) Provide minimum of 1 sessions for each class unless otherwise noted.
8. Distribute Training Evaluation Form following each training session.
- a. Training Evaluation Form is included in this Section.
 - b. Return completed Training Evaluation Forms to Owner's designated training coordinator immediately after session is completed.
 - c. Revise training sessions judged "Unsatisfactory" by a majority of attendees.
 - 1) Conduct training sessions again until a satisfactory rating is achieved at no additional cost to Owner.
9. Submittals:
- a. Prior to the training session:
 - 1) Instructor qualifications: Due 30 calendar days prior to initial training session.
 - 2) Training course materials: Due 14 calendar days prior to initial training session.
 - 1) Training agenda, lesson plan, presentation, and handouts.
 - 2) Other audio-visual aids utilized during each training course.
 - 3) Format: 2 electronic copies and 3 hard copies organized in notebooks.
 - b. Post training session:
 - 1) Training course materials: Due 14 calendar days after class completion.
 - 1) Video recordings.
 - 2) Class attendance sheet.

- 3) Training agenda, final lesson plan, presentation, and handouts.
- 4) Other audio-visual aids utilized during each training course.
- 5) Provide materials for all sessions of the class in a single transmittal.
- 6) Format: 2 electronic copies and 3 hard copies organized in notebooks.

D. Installation Testing:

1. Perform subsystem testing according to approved Subsystem Testing Plans.
2. Suppliers shall provide on-site startup support as defined in Contract Documents.^{AD2}
- 2.3. Initiate the Manufacturer's Certificate of Installation and Functionality Compliance for all equipment.
 - a. Manufacturer's Certificate of Installation and Functionality Compliance form is included in this Section.
 - b. Manufacturer's Certificate of Installation and Functionality Compliance certifies the equipment meets the following requirements:
 - 1) Has been properly installed, adjusted, aligned, and lubricated.
 - 2) Is free of any stresses imposed by connecting piping or anchor bolts.
 - 3) Is able to be operated as necessary for Functional Testing.
 - c. Form shall be submitted after completion of Functional Testing, as specified in this Section.
- 3.4. Coordinate Installation Testing with restrictions and requirements as specified in Section 01140 - Work Restrictions.
- 4.5. Perform coating holiday testing as specified in Section 09960 – High-Performance Coatings.
- 5.6. Perform pressure and leakage testing as specified in individual component Sections and Section 15956 - Piping Systems Testing.
- 6.7. Perform mechanical equipment Installation Testing: As specified below and in individual equipment sections, such as Section 15050 - Common Work Results for Mechanical Equipment, Section 15954 - Testing, Adjusting, and Balancing for HVAC, and Section 15958 - Mechanical Equipment Testing
 - a. Remove rust preventatives and oils applied to protect equipment during construction.
 - b. Flush lubrication systems and dispose of flushing oils.
 - 1) Recharge lubrication system with lubricant recommended by manufacturer.
 - c. Flush fuel system and provide fuel for testing and start-up.
 - d. Install and adjust packing, mechanical seals, O-rings, and other seals. Replace defective seals.
 - e. Remove temporary supports, bracing, or other foreign objects installed to prevent damage during shipment, storage, and erection.
 - f. Check rotating machinery for correct direction of rotation and for freedom of moving parts before connecting driver.
 - g. Perform cold alignment and hot alignment to manufacturer's tolerances.
 - h. Adjust V-belt tension and variable pitch sheaves.
 - i. Inspect hand and motorized valves for proper adjustment.
 - 1) Tighten packing glands to ensure no leakage, but permit valve stems to rotate without galling.
 - 2) Verify valve seats are positioned for proper flow direction.
 - j. Tighten leaking flanges or replace flange gasket.
 - 1) Inspect screwed joints for leakage.

- k. Install gratings, safety chains, handrails, shaft guards, and sidewalks prior to operational testing.

~~7.8.~~ Electrical devices and subsystems Installation Testing: As specified below, in Section 16950 - Field Electrical Acceptance Tests, and the technical sections.

- a. Complete requirements as specified in Section 16305 - Electrical System Studies.

~~8.9.~~ Instrumentation devices and subsystems Installation Testing: As specified below, in Section 17950 - Testing, Calibration, and Commissioning, and technical sections.

E. Functional Testing:

- 1. Prerequisite: Successful completion with Construction Manager approval of Installation Testing.

- 2. Suppliers shall provide on-site startup support as defined in Contract Documents.^{AD2}

- ~~2.3.~~ Complete valve and gate labeling as specified in Section 15076 - Pipe Identification prior to the start of Functional Testing.

- ~~3.4.~~ Perform subsystem testing according to approved Subsystem Testing Plan.

- a. Heating, ventilating, and air conditioning systems.
 - 1) As specified in Section 15954 - Testing, Adjusting, and Balancing for HVAC, and technical sections.

- ~~4.5.~~ Notify the Construction Manager 5 days prior to when the Work is ready for Functional Testing.

- a. Perform testing in the presence of the Construction Manager.

- ~~5.6.~~ Determine Functional Testing durations with Owner's input.

- a. Durations will vary depending on the availability of water for testing.
 - b. Target minimum Functional Test duration: 8 hours.
 - 1) Identify equipment/system that cannot be tested for a minimum of 8 hours as specified in technical sections.

- ~~6.7.~~ Perform Functional Testing as specified in technical sections.

- a. Perform Functional Testing in addition to the other tests specified in the technical sections.
 - b. Perform Functional Testing to demonstrate that the component equipment functions as an entire system in accordance with the design requirements.
 - c. Perform Functional Testing to demonstrate that the unit process has operated in a manner necessary to demonstrate equipment/system functions manually in local, manually in remote (or remote manual), and automatically in remote (in remote auto).
 - d. Perform testing with Contractor-provided water.
 - e. Repair or replace parts that operate improperly and retest.
 - f. Submit testing reports as specified in the technical sections to the Owner and Engineer for approval of Functional Testing reports.

- ~~7.8.~~ In order to complete functional testing, the Contractor must perform closed loop test(s) in accordance with the Contract Documents.

- a. Functional Testing of the closed loop system involves functional testing of the horizontal split case pump station, water storage tank, and on-site potable water yard piping.
 - b. Contractor is responsible for providing temporary fittings, piping and appurtenances needed to perform the closed loop testing.
 - c. Contractor is responsible for obtaining water to perform the functional testing.

- 1) Upon completion and acceptance of closed loop testing, water used may be discharged to onsite detention basin. Contractor shall take care to not overflow the basin.

8.9. Provide completed Manufacturer's Certificate of Installation and Functionality Compliance forms for all equipment.

- a. Manufacturer's Certificate of Installation and Functionality Compliance form is included in this Section.
- b. Manufacturer's Certificate of Installation and Functionality Compliance certifies the equipment/system meets the following requirements:
 - 1) Is suitable for satisfactory full-time operation under full-load conditions.
 - 2) Operates within the allowable limits for vibration and noise.
 - 3) Electrical and instrumentation requirements:
 - 1) Electrical equipment, instrumentation, and control panels are properly installed, calibrated, and functioning.
 - 2) Electrical Installation Testing is complete, and test results have been approved by the Engineer.
 - a) Noted deficiencies have been corrected.
 - b) Relays, circuit breakers, and other protective devices are set.
 - 3) Control logic for start-up, shutdown, sequencing, interlocks, control, and emergency shutdown has been tested and is properly functioning.
 - 4) Motor control is calibrated and tested.

F. Clean Water Facility Testing:

1. Utilize potable water.
2. Prerequisite: Successful completion with Construction Manager approval of Functional Testing.
3. Test entire facility with recirculating water supply at the design flow for the largest single process or system train to ensure proper complete facility (equipment/system) hydraulic performance.
4. Perform testing in the presence of the Engineer unless such presence is expressly waived in writing.
5. The purpose of Clean Water Facility Testing is to confirm extended equipment/system operation prior to process start-up.
 - a. Testing shall occur for a minimum of 7 days with all systems operational to the extent possible.
6. Reset to condition prior to testing:
 - a. Remove, clean and replace permanent and temporary filters and strainers in pipeline systems.
 - b. Replace HVAC filters, dewater and clean sumps.

G. Closeout documentation submittals:

1. Provide records generated during Commissioning Phase of Project including but not limited to:
 - a. Training documentation.
 - b. Manufacturer's Certificate of Source Testing.
 - c. Manufacturer's Certificate of Installation and Functionality Compliance.
 - d. Daily logs of equipment/system testing identifying tests conducted and outcome.
 - e. Test forms and documentation.

- f. Functional Testing results.
- g. Logs of time spent by manufacturer's representatives performing services on the job site.
- h. Equipment lubrication records.
- i. Electrical phase, voltage, and amperage measurements.
- j. Insulation resistance measurements.
- k. Bearing temperature measurements.
- l. Data sheets of control loop testing including testing and calibration of instrumentation devices and setpoints.
- m. Provide: 2 electronic copies and 3 hard copies organized in notebooks.
- n. Due date: Within 14 calendar days of Substantial Completion.

1.08 PHASE 1 COMMISSIONING - PUMP STATION START-UP

A. Overview of Phase 1 of the Pump Station Start-Up:

1. Suppliers shall provide on-site startup support as defined in Contract Documents.^{AD2}
- 1.2. The Contractor shall fully test and commission the Terminal Site Pump Station by pumping to the on-site tank for a period of 7 consecutive days.
- 2.3. The pump station and ancillary facilities shall be fully functional to verify the performance meets the requirements of these Drawings and Specifications. The piping, appurtenances, pump station mechanical systems, surge tank and compressor, tank, electrical systems, instrumentation controls, PLC, and all other ancillary facilities required for a fully functional pump station shall be installed, tested, fully functional, and disinfected prior to performing Phase 1 Commissioning.
- 3.4. The Contractor shall provide the on-site supervision, temporary piping, temporary valves, and all other equipment to operate the pump station during the Phase 1 Commissioning.
- 4.5. The Contractor shall fill the piping system and tank with potable water by connecting to the City's potable water distribution system in the location shown in the Drawings. See Section 01500 for obtaining water for testing.
- 5.6. Upon completion of Phase 1 Commissioning, the Contractor shall drain the tank and flush the transmission pipelines with potable water. Refer to specification 02554 for all requirements.
- 6.7. The Contractor shall complete the pump station startup phase by the date listed in this section.

B. Pump Station Start-Up:

1. Prerequisite: Successful completion with Engineer approval of Clean Water Facility Testing.
2. Perform process start-up in the presence of the Construction Manager.
3. Pre-start-up activities and submittals:
 - a. Commissioning Documentation and Data Review.
 - b. Start-Up Go/No-Go Decision Criteria.
 - c. Building and Fire Inspection Compliance Check.
 - d. Start-Up Sequence Review.
 - e. Start-Up plan for review by Engineer not less than 90 calendar days prior to planned commencement of process start-up activities.
 - 1) Include the following:
 - 1) Pre-start-up activities.
 - 2) Start-Up.

- 3) Operational Period.
 - 4) PCIS Optimization and Fine-Tuning.
- f. Description of Temporary Testing Arrangement.
- g. Final Process Start-Up Forms and Documentations.
- h. Final Operational Testing Plan.
- 4. Control loop tuning.
 - a. Perform control loop tuning during system testing with water to the extent possible.
- 5. Process area start-ups.
 - a. Process start-up individual process areas comprised of multiple interdependent systems where possible and beneficial to reduce complexity and risk of complete facility testing.
 - b. Process area test flows may be limited by upstream and downstream process constraints (i.e., tank and basin volumes) and/or localized recirculation capabilities.
- 6. Facility-wide process start-up.
 - a. Upon approved completion of pre-start-up activities, perform entire facility process start-up.
 - 1) Complete control loop tuning during this phase of process start-up.
 - 2) Continue process start-up operations until facility meets or exceeds the Contract requirements.
 - b. HVAC systems start-up and testing:
 - 1) Test complete HVAC system for the facility.
 - c. Ancillary systems start-up and testing:
 - 1) Test complete security system, phone system, fire alarm system, etc. for the facility.
 - d. Remaining equipment/system tests:
 - 1) Conduct remaining specified equipment/system performance tests that could not be performed during the Testing and Training Phase due to inter-system and/or treatment process dependencies.

1.09 MAINTENANCE OF PUMP STATION, TANK, AND ALL TERMINAL TANK SITE FACILITIES BETWEEN PHASE 1 AND PHASE 2 COMMISSIONING

- A. After completion of Phase 1 Commissioning, Contractor shall perform maintenance of the Terminal Tank and Pump Station Facilities per Section 02554.

1.10 PHASE 2 COMMISSIONING

- A. Overview of Phase 2 Commissioning
 - 1. Prerequisites:
 - a. Successful completion of Phase 1 of the testing and Engineer's approval
 - 2. Suppliers shall provide on-site startup support as defined in Contract Documents.^{AD2}
 - 2-3. Phase 2 Commissioning generally consists of the following:
 - a. Process Start-Up
 - b. Temporary Pumping to the Distribution System
 - c. Project Commissioning and Operational Period
- B. Process Start-Up
 - 1. Perform process start-up in the presence of the Construction Manager.
 - 2. Pre-start-up activities and submittals:

- a. Commissioning Documentation and Data Review.
- b. Start-Up Go/No-Go Decision Criteria.
- c. Building and Fire Inspection Compliance Check.
- d. Process Start-Up Sequence Review.
- e. Process Start-Up plan for review by Engineer not less than 90 calendar days prior to planned commencement of process start-up activities.
 - 1) Include the following:
 - 1) Pre-start-up activities.
 - 2) Process Start-Up.
 - 3) Process Operational Period.
 - 4) PCIS Optimization and Fine-Tuning.
- f. Description of Temporary Testing Arrangement, if applicable.
- g. Final Process Start-Up Forms and Documentations.
- h. Final Operational Testing Plan.
- 3. Control loop tuning.
 - a. Perform control loop tuning during system testing with water to the extent possible.
- 4. Process area start-ups.
 - a. Process start-up individual process areas comprised of multiple interdependent systems where possible and beneficial to reduce complexity and risk of complete facility testing.
 - b. Process area test flows may be limited by upstream and downstream process constraints (i.e., tank and basin volumes) and/or localized recirculation capabilities.
- 5. Facility-wide process start-up.
 - a. Upon approved completion of pre-start-up activities, perform entire facility process start-up.
 - 1) Complete control loop tuning during this phase of process start-up.
 - 2) Continue process start-up operations until facility meets or exceeds the Contract requirements.
 - b. HVAC systems start-up and testing:
 - 1) Test complete HVAC system for the facility.
 - c. Ancillary systems start-up and testing:
 - 1) Test complete security system, phone system, fire alarm system, etc. for the facility.
 - d. Remaining equipment/system tests:
- 6. Conduct remaining specified equipment/system performance tests that could not be performed during the Testing and Training Phase due to inter-system and/or treatment process dependencies
- C. Temporary Pumping to the Distribution System
 - 1. Prerequisites:
 - a. Completion of Process Start-Up
 - b. SRWA delivery of water to the terminal tank site
 - 1) Delivery of water to the City's distribution system shall commence at the same time SRWA delivers potable water to the terminal tank site.

2. Contractor shall deliver potable water to the distribution system by installing a temporary pump station, piping, and appurtenances per Drawing 00G15 and Section 02554 and pumping at the following durations and flow rates:

POTABLE WATER DISTRIBUTION SYSTEM TEMPORARY PUMPING	
DURATION OF TEMPORARY PUMPING (DAYS)	TEMPORARY PUMPING FLOW RATE (MGD)*
7	0.8
7	1.7
7	2.5
39	3.33
30	3.7

* DISCHARGE PRESSURE SHALL BE 70 PSI
AT ALL FLOW CONDITIONS.

- a. Pumping shall be continuous, beginning at 0.8 million gallons per day (MGD) and consecutively increase in flow rate per the above table to 3.7 MGD.
3. The Contractor shall operate the pump station, tank, pressure reducing valves, electrical and control systems, and all other ancillary facilities to confirm a fully functional system.

D. Project Commissioning and Operational Period:

1. Prerequisite: Successful completion with Construction Manager approval of Temporary Pumping to the Distribution System.
2. Prior to beginning the Process Operational Period:
 - a. Conformance with standards is required prior to Operational Testing, if applicable.
 - b. Correct any outstanding punch list items prior to the Operational Testing.
3. Duration: 21 calendar days.
4. Schedule: Commence immediately after completing Phase 2 Commissioning - Temporary Pumping to the Distribution System
5. Contractor shall operate the pump station for the duration of testing.
 - a. Contractor shall allow Owner to operate the facilities when requested by the Owner to become familiar with the facility operation.
6. Construction Manager will be present for process operational period unless such presence is expressly waived in writing.
7. Prove facility conformance with Contract Document requirements.
8. Contractor to provide:
 - a. Specified start-up materials and operating supplies.
 - b. Necessary craft of labor assistance, in the event of an emergency equipment failure requiring immediate attention (emergency is defined as a failure of function which precludes the further operation of a critical segment of or the whole of the Work) with a response time of not more than 4 hours from the time of notification.
 - c. Manufacturer's authorized representative to supervise placing equipment/systems in operation and provide guidance during Operational Testing per applicable section.

- d. Necessary manufacturer's representatives and operating supplies for retesting systems that fail to pass the initial Operational Testing due to deficiencies in products of workmanship at no additional cost to the Owner.
 - e. List of 24-hour "on-call" representative supervisory persons who will monitor the Operational Testing and serve as liaison for the Engineer, Construction Manager and Owner.
9. Owner will provide:
- a. Operations personnel periodically to observe testing and become familiar with the facility operation.
 - b. Owner will not be responsible for operation.
10. Contractor's CC shall oversee Project Commissioning Operational Period.
- a. Entire system shall continuously meet performance requirements and shall operate without fault, failure, or defect for a continuous period.
 - b. Individual equipment/system failures that are corrected within 24 hours and do not prevent the entire project from continuously satisfying the established operational requirements shall not require the consecutive day test to be restarted unless the failure recurs.
 - c. Restart the consecutive test period for any of the following conditions:
 - 1) Any failure of the complete Project construction to meet operational requirements.
 - 2) When malfunctions or deficiencies cause shutdown or partial operation of the facility, or results in failure of the complete Project construction to meet operational requirements.
 - 3) Any individual equipment/system failure that meets any of the following conditions:
 - 1) Requires more than 24 hours to correct, unless otherwise specified in Section 17950 - Testing, Calibration, and Commissioning.
 - 2) Recurs within the 24-hour correction period requiring further correction.
 - 4) Immediately correct defects in material, workmanship, or equipment/system which became evident during Operational Testing.
11. Permitting approval of Process Operational Period results required for Substantial Completion.

E. PCIS Optimization and Fine-Tuning:

- ~~1. Prerequisite: Successful completion with Construction Manager approval of Process Operational Period.~~
- ~~2. Test PCIS system for additional 60 days as specified in Section 17950 - Testing, Calibration, and Commissioning to identify issues and make corrections, as needed.~~
- 1. Commence with Project Commissioning and Operational Period.
- 2. Test PCIS system for 21 days as specified in Section 17950 - Testing, Calibration, and Commissioning to identify issues and make corrections, as needed. ^{AD3}
- 3. Permitting approval of PCIS Optimization and Fine-Tuning results required for Substantial Completion.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

MANUFACTURER'S CERTIFICATE OF SOURCE TESTING

OWNER _____ EQPT/SYSTEM _____
PROJECT NAME _____ EQPT TAG NO. _____
PROJECT NO. _____ EQPT SERIAL NO. _____
SPECIFICATION NO. _____
SPECIFICATION TITLE _____

Comments: _____

I hereby certify Source Testing has been performed on the above-referenced equipment/system as defined in the Contract Documents, and results conform to the Contract Document requirements. Testing data is attached.

Date of Execution: _____, 20____

Manufacturer: _____

Manufacturer's Authorized Representative Name (*print*): _____

(Authorized Signature)

If applicable, Witness Name (*print*): _____

(Witness Signature)

**MANUFACTURER'S CERTIFICATE OF
INSTALLATION AND FUNCTIONALITY COMPLIANCE**

OWNER _____ EQPT/SYSTEM _____
PROJECT NAME _____ EQPT TAG NO. _____
PROJECT NO. _____ EQPT SERIAL NO. _____
SPECIFICATION NO. _____
SPECIFICATION TITLE _____

I hereby certify the installation and function of the above-referenced equipment/system as defined in the Contract Documents. The above-referenced equipment/system has been: (Check Applicable)

- ☐ Installed in accordance with manufacturer's recommendations.
- ☐ Inspected, checked, and adjusted.
- ☐ Serviced with proper initial lubricants.
- ☐ Electrical/instrumentation and mechanical connections meet quality and safety standards.
- ☐ All applicable safety equipment has been properly installed.
- ☐ Functionally tested.
- ☐ System has been performance tested, and meets or exceeds specified performance requirements.

NOTES:

Attach test results with collected data and test report.

Attach written certification report prepared by and signed by the electrical and/or instrumentation subcontractor.

Comments: _____

I, the undersigned manufacturer's representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate this equipment/system, and (iii) authorized to make recommendations required to ensure that the equipment/system furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____

Manufacturer: _____

Manufacturer's Authorized Representative Name (*print*): _____

By Manufacturer's Authorized Representative: _____
(Authorized Signature)

TRAINING EVALUATION FORM

DATE: _____ NAME OF REPRESENTATIVE: _____

10. Comments: _____
- _____
- _____

Sessions judged “Unsatisfactory” by a majority of attendees shall be revised and conducted again until a satisfactory rating is achieved.

COMMISSIONING ROLES AND RESPONSIBILITIES MATRIX

NO.	TASK	OWNER	CONTRACTOR	ENGINEER
Testing and Training Phase				
Source Testing				
1	Source Testing	Witness	Lead	Witness, Review
Installation Testing				
2	Electrical Conductor Testing	No Action	Lead	Witness
3	Electrical Field Acceptance Tests	No Action	Lead	Witness
4	Instrument Field Calibration	No Action	Lead	Witness
5	Network Installation Testing	Witness	Lead	Witness
6	Loop Testing	Witness	Lead	Witness
7	Pressure Testing	No Action	Lead	Witness
8	Leak Testing	No Action	Lead	Witness
9	Holiday Testing	No Action	Lead	Witness
10	HVAC Testing	No Action	Lead	Witness
11	Motor Electrical Testing	No Action	Lead	Witness
Functional Testing				
12	Network Operational Testing	Witness	Lead	Review
13	Preliminary Run Testing Local/Manual Control	Witness	Lead	Review
14	PCIS Functional Demonstration Testing - Local/Auto Control Testing - Remote/Manual Contact Testing - Alarm Testing - Control Loop Testing	No Action	Lead	Review
15	Subsystem Start-Up and Testing	Witness	Lead	Review
16	Equipment/System Start-Up and Testing	Witness	Lead	Review
17	HVAC Start-Up and Testing	Witness	Lead	Review
18	Corrosion Control Start-Up and Testing	Witness	Lead	Review
19	Wide Area Network Communications Testing	Support	Lead	Witness
20	Manufacturer's Certificate of Installation and Functionality Compliance	No Action	Lead	Witness, Review
Clean Water Facility Testing				
21	Test Water Management Plan Finalization	Support	Lead	Review
22	Clean Water Facility Testing	Witness	Lead	Witness, Review
Process Start-Up Phase				
Process Start-Up				
23	Commissioning Documentation and Data Review	Review	Support	Lead
24	Start-Up Go/No-Go Decision Criteria	Lead	Support	Review
25	Building and Fire Inspection Compliance Check	No Action	Lead	Witness

NO.	TASK	OWNER	CONTRACTOR	ENGINEER
Testing and Training Phase				
26	HVAC Functionality Check	No Action	Lead	Witness
27	Start-Up Sequence Review	Support	Lead	Review
28	Temporary Testing Arrangement Finalization	Support	Lead	Support
29	Start-Up Forms Finalization	Support	Lead	Support
30	Operation Testing Plan Finalization	Review	Support	Lead
31	Test Water Management Plan Finalization	Support	Lead	Review
32	System Testing	Support	Lead	Witness
33	Control Loop Tuning	Support	Lead	Witness
34	Process Area Start-Ups	Support	Lead	Witness
35	Facility-Wide Start-Up	Support	Lead	Witness
36	Process Control Systems Testing	Support	Lead	Witness
38	HVAC Final Testing, Adjust, and Balancing	Witness	Lead	Witness, Review
Process Operational Period				
39	Operational Testing	Support	Lead	Witness, Review
40	Final Testing Reports	Support	Lead	Review
41	Water Quality Testing and Documentation	Support	Lead	Review
PCIS Optimization and Fine-Tuning				
42	As specified in Section 17950 - Testing, Calibration, and Commissioning	Support	Lead	Review
Legend: Lead: Primarily responsible for organization, coordination, and execution of task work product or result. Support: Assist the lead with organization, coordination, and execution of task work product or result. Witness: Observe and document completion of task work product or result. Review: As necessary to accept task work product result. No Action: Limited or no involvement.				

AD2 Addendum No. 2

AD3 Addendum No. 3

SECTION 02050

SOILS AND AGGREGATES FOR EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Material requirements for soils and aggregates.

1.02 REFERENCES

- A. ASTM International (ASTM):
1. C117 - Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing.
 2. C131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 3. C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 4. C535 - Standard Test Method for Resistance to Degradation of Larger-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 5. D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
 6. D2844 - Standard Test Method for Resistance R-Value and Expansion Pressure of Compacted Soils.
 7. D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 8. D4829 - Standard Test Method for Expansion Index of Soils.
 9. D5821 - Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate.
- B. California State Transportation Agency, Department of Transportation (CALTRANS):
1. (Standard Specifications).
 2. California Test Methods (CTM):
 - a. California Test 205 - Method of Test for Determining Crushed Particles.
 - b. California Test 211 - Method of Test for Abrasion of Coarse Aggregate by Use of the Los Angeles Abrasion Testing Machine.
 - c. California Test 217 - Method of Test for Sand Equivalent.
 - d. California Test 229 - Method of Test for Durability Index.
 - e. California Test 301 - Method of Test for Determining the Resistance "R" Value of Treated and Untreated Bases, Subbases, and Basement Soils by the Stabilometer.

1.03 SUBMITTALS

- A. Product data:
1. Material source.
 2. Gradation.
 3. Testing data.

- B. Quality control for aggregate base course:
 - 1. Test reports: Reports for tests required by Sections of Standard Specifications.
 - 2. Certificates of Compliance: Certificates as required by Sections of Standard Specifications.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Storage and protection: Protect from segregation and excessive moisture during delivery, storage, and handling.
- B. Comply with Standard Specifications storage requirements, if applicable.

PART 2 PRODUCTS

2.01 MATERIALS - GENERAL

- A. Provide material having maximum particle size not exceeding 4 inches and that is free of trash, lumber, debris, leaves, grass, roots, stumps, and other organic matter.
- B. Materials derived from processing demolished or removed asphalt concrete are not acceptable.
- C. Comply with soil and aggregate material requirements in the Standard Specifications, unless specified otherwise.

2.02 NATIVE MATERIAL

- A. Native soil-select:
 - 1. Sound earthen material.
 - 2. Where permitted to be used in CLSM per Section 02312 and trench pipe embedment zone and/or backfill per Section 02318, native soil-select shall be screened to reduce all clumps and all deleterious and organic material shall be removed.
 - 3. Organic content not to be greater than 3 percent by volume.^{AD2}
 - 2.4. Sum of plasticity index when tested in accordance with ASTM D4318 and the percent of material by weight passing a Number 200 sieve shall not exceed 23 when tested in accordance with ASTM C136.
 - 3. ~~Organic content not to be greater than 3 percent by volume.~~
 - 4. ~~Where permitted to be used in CLSM per Section 02312, native soil select shall be screened to reduce all clumps and all deleterious and organic material shall be removed.~~^{AD2}
 - 5. Corrosion resistance requirements:
 - a. Resistivity minimum (wet aggregates): 5,000 ohm-cm.
 - b. pH: 5.0 to 12.0.
 - c. Chlorides maximum: 100 parts per million.
 - d. Sulfates maximum: 200 parts per million.

2.03 AGGREGATE BASE COURSE

A. Material requirements:

1. Class 2, 3/4-inch maximum aggregate size, free from organic matter and other deleterious substances, and of such nature that aggregate can be compacted readily under watering and rolling to form a firm, stable base.
2. Aggregate base course for structures:
 - a. Consist of crushed or fragmented particles.
 - b. Coarse aggregate material retained in Number 4 sieve shall consist of material of which at least 25 percent by weight shall be crushed particles when tested in accordance with California Test 205.
3. Aggregate shall not be treated with lime, cement, or other chemical material.
4. Durability index: Not less than 35 when tested in accordance with California Test 229.
5. Aggregate grading and sand equivalent tests shall be performed to represent not more than 500 cubic yards ~~or 1 day's production of material, whichever is smaller~~ of aggregate base course and when a new source of material is provided^{AD2}.
6. Sand equivalent: Not less than 25 when tested in accordance with California Test 217.
7. Resistance (R-value): Not less than 78 when tested in accordance with California Test 301.
8. Conforms to size and grade within the following limits when tested in accordance with ASTM C117 and ASTM C136:

Sieve Sizes (Square Openings)	Percent by Weight Passing Sieve
1 inch	100
3/4 inch	90 - 100
Number 4	35 - 60
Number 30	10 - 30
Number 200	2 - 9

2.04 GRAVEL

~~B-A.~~ Material requirements:

1. Consists of hard, durable particles of stone or gravel; or crushed to the specified sizes and gradations; and free from organic matter, lumps or balls of clay, and other deleterious matter.
2. Crush or waste coarse material and add or waste fine material in order to meet the specified gradations.
3. Fraction of material passing Number 40 sieve: Material having plasticity index not greater than 5 when tested in accordance with ASTM D4318.
4. Durability: Percentage of wear not greater than 40 percent when tested in accordance with California Test 211.
5. Conform to sizes and grade within the following limits when tested in accordance with ASTM C117 and C136:

Sieve Size (Square Openings)	Percent by Weight Passing Sieve		
	Type A	Type B	Type C
2 inch	100	--	--
1-1/2 inch	95 - 100	100	--
3/4 inch	35 - 60	55 - 85	100
3/8 inch	15 - 40	35 - 65	50 - 100
Number 4	0 - 25	20 - 35	30 - 45
Number 30	--	5 - 15	10 - 20
Number 200	0 - 5	2 - 9	2 - 9

2.05 DRAIN ROCK

A. Material requirements:

1. Durability index: Percentage of wear not greater than 40 when tested in accordance with California Test 229.
2. Consists of hard, durable particles of stone or gravel; screened or crushed to specified size and gradation; and free from organic matter, lumps or balls of clay, or other deleterious matter.
3. Crush or waste coarse material and waste fine material as required to meet gradation requirements.
4. Conforms to size and grade within the following limits when tested in accordance with ASTM C117 and C136:

Sieve Size (Square Openings)	Percent By Weight Passing Sieve
2 inch	100
1-1/2 inch	95 - 100
3/4 inch	50 - 100
3/8 inch	15 - 55
Number 200	0 - 2

2.06 CLASS 2 PERMEABLE FILL

A. Material requirements:

- ~~1.~~ [Durability index: Percentage of wear not greater 40 when tested in accordance with California Test 229.]^{AD2}

2.07 SAND

- A. Clean, coarse, natural sand.
- B. Non-plastic when tested in accordance with ASTM D4318.

~~G.C.~~ Conforms to size and grade within the following limits when tested in accordance with ASTM C117 and C136:

Sieve Size (Square Openings)	Percent by Weight Passing Sieve
1/2 inch	100
Number 200	0 - 20

2.08 STABILIZATION MATERIAL

~~H.A.~~ Durability percentage of wear not greater than 40 percent when tested in accordance with California Test 211.

~~I.B.~~ Consists of clean, hard, durable particles of crushed rock or gravel; screened or crushed to the specified sizes and gradations; and free of any detrimental quantity of soft, friable, thin, elongated, or laminated pieces, disintegrated material, organic matter, oil, alkali, or other deleterious substance.

~~J.C.~~ Shall be free of slaking or decomposition under the action of alternate wetting and drying.

~~K.D.~~ The portion of material retained on the 3/8-inch sieve shall contain at least 50 percent of particles having 3 or more fractured faces. Not over 5 percent shall be pieces that show no such faces resulting from crushing. Of that portion which passes the 3/8-inch sieve but is retained on the Number 4 sieve, not more than 10 percent shall be pieces that show no faces resulting from crushing.

~~L.E.~~ Conforms to size and grade when tested in accordance with ASTM C117 and ASTM C136.

Sieve Size (Square Openings)	Percent by Weight Passing Sieve
1 inch	100
3/4 inch	90 - 100
Number 4	0 - 10
Number 200	0 - 2

2.09 NO. 2 CRUSHED STONE

A. Material requirements:

- Consists of hard, durable particles of stone or gravel; or crushed to the specified sizes and gradations; and free from organic matter, lumps or balls of clay, and other deleterious matter.
- Crush or waste coarse material and add or waste fine material in order to meet the specified gradations.

3. Crushed stone must be processed through a 3-inch square screen and the product may contain limestone, gneiss, trap rock or approved equal.
4. Conform to sizes and grade within the following limits when tested in accordance with ASTM C117 and C136:

<u>Sieve Size</u> <u>(Square Openings)</u>	<u>Percent by Weight</u> <u>Passing Sieve</u>
<u>2-1/2 inch</u>	<u>100</u>
<u>1-1/2 inch</u>	<u>0</u>

2.10 RIVER ROCK

A. Material requirements:

1. Consists of hard, durable particles of stone; and free from organic matter, lumps or balls of clay, and other deleterious matter.
2. Stone must be processed through a 24-inch square screen and the product may contain limestone, gneiss, trap rock or approved equal.
3. Conform to sizes and grade within the following limits when tested in accordance with ASTM C117 and C136:

<u>Sieve Size</u> <u>(Square Openings)</u>	<u>Percent by Weight</u> <u>Passing Sieve</u>
<u>18-inch</u>	<u>100</u>
<u>12-inch</u>	<u>30</u>
<u>6-inch</u>	<u>0</u> ^{AD3}

PART 3 EXECUTION

Not Used.

END OF SECTION

^{AD2} Addendum No. 2

^{AD3} Addendum No. 3

SECTION 02200

SITE CLEARING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Clearing, grubbing, and stripping project site.

1.02 DEFINITIONS

- A. Clearing: Consists of removal of natural obstructions and existing foundations, buildings, fences, lumber, walls, stumps, brush, weeds, rubbish, trees, boulders, utility lines, and any other items which interferes with construction operations or are designated for removal.
- B. Grubbing: Consists of the removal and disposal of wood or root matter below the ground surface remaining after clearing and includes stumps, trunks, roots, or root systems greater than 1 inch in diameter or thickness to a depth of 6 inches below the ground surface.
- C. Stripping: Includes the removal and disposal of all organic sod, topsoil, grass and grass roots, and other objectionable material remaining after clearing and grubbing from the areas designated to be stripped. The depth of stripping is estimated to be ~~6 inches~~ 18 inches^{AD3}, but the required depth of stripping will be determined by the Engineer.

1.03 QUALITY ASSURANCE

- A. Regulatory requirements: Verify and comply with applicable regulations regarding those governing noise, dust, nuisance, drainage and runoff, fire protection, and disposal.
- B. Pre-construction conference: Meet with Engineer to discuss order and method of work.

1.04 PROJECT CONDITIONS

- A. Environmental requirements:
 - 1. For suspected hazardous materials found: As specified in Section 01354 - Hazardous Material Procedures.

1.05 SEQUENCING AND SCHEDULING

- A. Clearing, grubbing, and stripping: Perform clearing, grubbing, and stripping in advance of grading operations.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions: Examine site and verify existing conditions for beginning work.

3.02 PREPARATION

- A. Protect existing improvements from damage by site preparation work.

3.03 INSTALLATION

- A. Clearing:
1. Clear areas where construction is to be performed and other areas as indicated on the Drawings, or specified in this Section, of fences, lumber, walls, stumps, brush, roots, weeds, trees, shrubs, rubbish, and other objectionable material of any kind which, if left in place, would interfere with proper performance or completion of the work, would impair its subsequent use, or form obstructions.
 2. Do not incorporate organic material from clearing and grubbing operations in fills and backfills.
 3. Contractor's temporary construction facilities: Fill or remove pits, fill, and other earthwork required for erection of facilities, upon completion of the work, and level to meet existing contours of adjacent ground.
- B. Grubbing:
1. From excavated areas: Grub stumps, roots, and other obstructions 3 inches or over in diameter to depth of not less than 18 inches below finish grade.
 2. In embankment areas or other areas to be cleared outside construction area: Do not leave stumps, roots, and other obstructions higher than the following requirements:

Height of Embankment over Stump	Depth of Clearing and Grubbing
0 feet to 2 feet	Grub stumps or roots 3 inches or over in diameter to 18 inches below original grade. Cut others flush with ground.
2 feet to 3 feet	Grub stumps 1 foot and over in diameter to 18 inches below original grade. Cut others flush with ground.
Over 3 feet	Leave no stumps higher than stump top diameter, and in no case more than 18 inches.

3. Backfill and compact cavities left below subgrade elevation by removal of stumps or roots to density of adjacent undisturbed soil.

- C. Stripping:
1. Remove soil material containing sod, grass, or other vegetation to depth of ~~6 inches~~ 18 inches as indicated on the Drawings^{AD3} from areas to receive fill or pavement and from area within 5 feet outside foundation walls.

2. Deposit stripped material in accordance with following requirements:
 - a. At locations acceptable to Engineer.
 - b. ~~Use accepted material in top 6 inches of areas to be used for future planting.~~ Use accepted material areas to be used for future planting per Section 02802.^{AD3}
3. Replace topsoil where indicated on the Drawings.

D. Material reuse and recycling:

1. 100 percent of trees, stumps, rocks and associated vegetation and soils resulting primarily from land clearing shall be reused or recycled. For a phased project, such material may be stockpiled on site until project completion.
2. Contractor shall provide Engineer with list of local markets and salvage sites for reuse of clearing debris.

END OF SECTION

^{AD3} Addendum No. 3

SECTION 02300

EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Loosening, excavating, filling, grading, borrow, hauling, preparing subgrade, compacting in final location, wetting and drying, and operations pertaining to site grading for buildings, basins, reservoirs, boxes, roads, and other facilities.
 - 2. Backfilling and compacting under and around structures.
 - 3. Loosening, excavating, filling, fine grading and operations pertaining to topsoil of damaged agricultural land.

1.02 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. Standard Specifications for Highway Bridges.
- B. ASTM International (ASTM):
 - 1. D698-Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³).
 - 2. D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method.
 - 3. D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³).
 - 4. D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods.

1.03 DEFINITIONS

- A. Backfill adjacent to structure: Backfill within volume bounded by the exterior surfaces of structure, the surface of undisturbed soil in the excavation around structure, and finish grade around structure.
- B. Embankments: Dikes, levees, berms, and similar facilities.
- C. Excavation: Consists of loosening, removing, loading, transporting, depositing, and compacting in final location, wet and dry materials, necessary to be removed for purposes of construction of structures, ditches, grading, roads, and such other purposes as are indicated on the Drawings.

1.04 SUBMITTALS

- A. Copy of Property Owner's Agreement allowing placement of surplus soil material on their property.
- B. Excavation plan.

- C. Testing lab: Submit Contractor's proposed testing laboratory capabilities and equipment.
- D. Agronomist and land leveler qualifications.
- E. Test reports:
 - 1. Submit certified test reports of tests specified to be performed by the Contractor.
 - 2. Sign and seal test reports by a registered Geotechnical Engineer registered in California.

1.05 QUALITY ASSURANCE

- A. Initial compaction demonstration:
 - 1. Adequacy of compaction equipment and procedures: Demonstrate adequacy of compaction equipment and procedures before exceeding any of following amounts of earthwork quantities:
 - a. 50 cubic yards of backfill adjacent to structures.
 - b. 100 cubic yards of embankment work.
 - c. 100 cubic yards of fill.
 - d. 50 cubic yards of roadway base material.
 - e. 100 cubic yards of road fill.
 - 2. Compaction sequence requirements: Until specified degree of compaction on previously specified amounts of earthwork is achieved, do not perform additional earthwork of the same kind.
 - 3. After satisfactory conclusion of initial compaction demonstration and at any time during construction, provide confirmation tests as specified under "FIELD QUALITY CONTROL."
- B. Contractor shall perform work related to this Section in accordance with the approved Stormwater Pollution Prevention Plan (SWPPP).

1.06 SEQUENCING AND SCHEDULING

- A. Schedule earthwork operations to meet requirements specified in this Section for excavation and uses of excavated material.
- B. If necessary, stockpile excavated material in order to use it at specified locations.
- C. Excavation, backfilling, and filling: Perform excavation, backfilling, and filling during construction in manner and sequence that provides drainage at all times.
- D. Upon completion of work in staging areas, redistribute stockpiled topsoil and perform fine grading in all damaged agricultural areas.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Performance requirements:
 - 1. Where mud or other soft or unstable material is encountered, remove such material and refill space with stabilization material. Wrap stabilization material with stabilization fabric.
 - 2. Obtain acceptable import material from other sources if surplus obtained within Project site does not conform to specified requirements or are not sufficient in quantity.
 - 3. No extra compensation will be made for hauling of fill materials nor for water required for compaction.

2.02 MATERIALS

- A. Water for compacting: Use water from source acceptable to Engineer.
- B. Soil and rock materials:
 - 1. General:
 - a. Provide aggregate base course, Class 2 permeable, controlled low-strength material, drain rock, gravel, native material, sand, select material, and stabilization material where specified or indicated on the Drawings.
 - b. If suitable surplus materials are available, obtain native material and select material from cut sections or excavations.
 - 2. Aggregate base course materials: As specified in Section 02050 - Soils and Aggregates for Earthwork.
 - 3. Class 2 permeable: As specified in Section 02050 - Soils and Aggregates for Earthwork.
 - 4. Drain rock: As specified in Section 02050 - Soils and Aggregates for Earthwork.
 - 5. Gravel: As specified in Section 02050 - Soils and Aggregates for Earthwork.
 - 6. Native material: As specified in Section 02050 - Soils and Aggregates for Earthwork.
 - 7. Sand: As specified in Section 02050 - Soils and Aggregates for Earthwork.
 - 8. Select material: As specified in Section 02050 - Soils and Aggregates for Earthwork.
 - 9. Stabilization material: As specified in Section 02050 - Soils and Aggregates for Earthwork.
- C. Controlled low-strength material: As specified in Section 02312 - Controlled Low Strength Materials (CLSM).
- D. Geotextile fabrics:
 - 1. Filter fabric: As specified in Section 02620 - Filter Fabric.
 - 2. Stabilization fabric: As specified in Section 02621 - Stabilization Fabric.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions:
 - 1. Character and quantity of material:
 - a. Verify character and quantity of rock, gravel, sand, silt, water, and other inorganic or organic materials to be encountered in work to be performed.
 - b. Determine gradation, shrinkage, and swelling of soil, and suitability of material for use intended in work to be performed.
 - c. Determine quantity of material, and cost thereof, required for construction of backfills, cuts, embankments, excavations, fills, and roadway fills, whether from onsite excavations. Include in cost of work to be performed.
 - d. Include wasting of excess material, if required, in cost of work to be performed.

3.02 PREPARATION

- A. Backfills:
 - 1. After clearing and excavation are completed, scarify entire areas that underlie backfills or structures to a depth of 10 inches and until surface is free of ruts, hummocks, and other features that would prevent uniform compaction by equipment to be used.
 - 2. Recompect scarified areas to density specified before placing backfill material or concrete.
 - 3. Do not place backfill against walls until:
 - a. Walls have been cast full height of structure and concrete has reached the specified strength.
 - b. Connecting slabs and beams have been cast, and concrete has reached the specified strength.
 - 4. Prior to backfilling:
 - a. Remove forms.
 - b. Clean trash and debris from the excavation site.
 - 5. After inspection of foundation, walls, and pipes, place backfill symmetrically around structures to prevent eccentric loading of structures.
- B. Embankments:
 - 1. After clearing is completed, scarify entire areas that underlie embankments to a depth of 10 inches and until surface is free of ruts, hummocks, and other features that would prevent uniform compaction by equipment to be used.
 - 2. Recompect scarified areas to density specified for embankments before placing of embankment material.
- C. Fills:
 - 1. After clearing is completed, scarify entire areas that underlie fill sections or structures to a depth of 10 inches and until surface is free of ruts, hummocks, and other features that would prevent uniform compaction by equipment to be used.
 - 2. Recompect scarified areas to density specified for compacted fills before placing of fill material or concrete.

- D. Roadway fills:
 - 1. After clearing is completed, scarify entire areas that underlie roadway fills to a depth of 10 inches and until surface is free of ruts, hummocks, and other features that would prevent uniform compaction by equipment to be used.
 - 2. Recompact scarified areas to density specified for roadway fills before placing of roadway fill material.
- E. Sloped surfaces for fill or foundations:
 - 1. Foundations for fill having slopes in excess of 1 vertical to 4 horizontal:
 - a. Bench or terrace to adequately key existing ground and fill built thereon.
 - 2. Slopes of original hillsides and old fills: Bench minimum of 10 feet horizontally as fill is placed.
 - 3. Provision of new benches:
 - a. Start new bench wherever vertical cut of next lower bench intersects existing grade.
 - b. Recompact material thus cut out along with new embankment material at no additional cost to the Owner.
- F. Topsoil requirements in agricultural areas:
 - 1. Prior to excavation and stockpiling of topsoil that will be disturbed within staging areas during construction, Contractor shall hire an agronomist to identify and confirm the depth of topsoil throughout the staging areas.
 - a. For bid purposes, Contractor shall assume a depth of 18 inches.
 - 2. Contractor shall store all topsoil that will be disturbed within staging areas onsite and shall protect the topsoil until it is placed back on the staging area after construction.

3.03 INSTALLATION

- A. General:
 - 1. Dispose of excavated materials that are not required or are unsuitable for fill and backfill in lawful manner.
 - 2. Dispose of surplus material on private property only when written permission agreement is furnished by owner of property. Submit copies of such agreements.
 - 3. Rocks, broken concrete, or other solid materials larger than 4 inches in greatest dimension: Remove from project site at no additional cost to the Owner.
 - 4. Stabilization of subgrade: Provide materials used, or perform work required, to stabilize subgrade so it can withstand loads that may be placed upon it by Contractor's equipment.
- B. Compaction:
 - 1. Provide specified compaction for backfills, cuts, embankments, fills, roadway fills, and other earthwork.
 - 2. Perform confirmation tests to verify and confirm that work has complied, and is complying at all times, with compaction requirements specified in this Section for initial compaction demonstration and field quality control testing.
 - 3. In-place density of compacted backfills, cuts, embankments, fills, and roadway fills determined in accordance with ASTM D1556 or ASTM D6938.
 - 4. Maximum density, laboratory compaction: Soil maximum density and optimum water content when tested in accordance with ASTM D1557.

5. To prevent damage to structures due to backfilling operations, place backfill with equipment that does not exceed AASHTO Standard Specifications for Highway Bridges, H-20 vehicle loading, within a distance from the face of the structure of not less than 1/2 the depth of backfill. The depth of backfill is the distance between the level being compacted and the bottom of the excavation. Outside this distance, heavier compaction equipment may be used.
 6. Compact to percentage of maximum density as follows:
 - a. Backfill adjacent to structures: 95 percent.
 - b. Backfilling voids: 95 percent.
 - c. Embankments: 95 percent.
 - d. Loose fill:
 - 1) No compaction other than by hauling vehicles will be required.
 - 2) Uniformly distribute travel of vehicles over fill area as required to provide uniformly compacted surface.
 - e. Other areas: 90 percent.
 - f. Under present and future structures: 95 percent.
 - g. Under roadways, parking and storage areas, curbs, and sidewalks: 95 percent.
 - h. Upper 6 inches of cuts: 95 percent.
 - i. Fills: 95 percent.
- C. Dewatering: As specified in Section 02241 - Dewatering.
- D. Excavation:
1. Blasting: Not permitted.
 2. Excavations for trenching: As specified in Section 02318 - Trenching.
 3. Excavations for structures:
 - a. Provide excavations conforming to dimensions and elevations indicated on the Drawings for each structure.
 - b. After clearing is complete, excavate for the structure, down to the elevation indicated on the Drawings. Unless directed by Engineer, do not carry excavations below elevation indicated on the Drawings.
 - c. Where soil is encountered having unsuitable bearing value, Engineer may direct in writing that excavation be carried to elevations below those indicated on the Drawings.
 - d. Where excavations are made below elevations indicated on the Drawings, adjust elevations of excavations in accordance with the following requirements:
 - 1) Under slabs: Restore to proper elevation in accordance with procedure specified for backfill in this Section.
 - 2) Under footings: Restore to the proper elevation using one of the following:
 - a) Aggregate base course.
 - b) Controlled low-strength material.
 - e. Excavation width:
 - 1) Extend excavations at least 2 feet clear from walls and foundations of structures to allow for placing and removal of forms, installation of services, and inspection.
 - 2) Do not undercut slopes.
 - f. Difficulty of excavation: No extra compensation will be made for removal of rock or any other material due to difficulty of excavation.

4. Excavation of lined channels:
 - a. Excavations in open cut for lined channels may be made so as to place concrete directly against excavated surfaces providing faces of excavations are:
 - 1) Firm and unyielding.
 - 2) Will stand or can be made to stand without sloughing.
 - b. Excavations to provide subgrade for lined channel or subdrainage material: Excavate to lines and grades indicated on the Drawings.
5. Excavation of unlined channels and basins:
 - a. Excavate to lines and grades indicated on the Drawings.
 - b. Perform excavation and grading so that finish surfaces are in uniform planes with no abrupt breaks in surface.
6. Excavation of ditches and gutters:
 - a. Cut ditches and gutters accurately to cross sections and grades indicated on the Drawings.
 - b. Take care not to excavate ditches and gutters below grades indicated on the Drawings.
 - c. Backfill excessive ditch and gutter excavations to grade with suitable material acceptable to the Engineer.
 - d. Do not deposit any material within 3 feet of edge of ditch unless otherwise indicated on the Drawings.
7. Necessary over excavation:
 - a. Where it becomes necessary to excavate beyond normal lines of excavation in order to remove boulders or other interfering objects, backfill voids remaining after removal as specified in backfilling of voids below, or as acceptable to the Engineer.
 - b. Backfill voids with material acceptable to the Engineer:
 - 1) With acceptance of the Engineer, backfill with one of the following:
 - a) Aggregate base course.
 - b) Controlled low-strength material.

E. Materials for backfills, embankments, fills, and roadway fills:

1. General:
 - a. Obtain import material from other sources if surplus materials from cuts and excavations obtained from within Project site do not conform to specified requirements or are not sufficient in quantity for construction of Project.
2. Backfills:
 - a. Backfill adjacent to structures, slabs, or walls: Native material, select material or imported material meeting the requirements of the Geotechnical Report, unless otherwise specified or indicated on the Drawings.
 - b. Backfill material under concrete structures: Aggregate base course material, except in areas where controlled low-strength material or concrete encasement are indicated on the Drawings.
 - c. Extend backfill in any area under concrete structures from undisturbed soil or rock to the bottom aggregate base course material layer.
3. Embankments:
 - a. Native material, select material, or imported material meeting the requirements of the Geotechnical Report, unless otherwise specified or indicated on the Drawings.

4. Fills:
 - a. Native material, select material, or imported material meeting the requirements of the Geotechnical Report, unless otherwise specified or indicated on the Drawings.
 - b. Extend fill in any area under concrete structures from undisturbed soil or rock to the bottom aggregate base course material layer.
5. Roadway fills: One of the following, unless otherwise specified or indicated on the Drawings:
 - a. Aggregate base course material.
 - b. Native material, select material, or imported material meeting the requirements of the Geotechnical Report.

F. Placement:

1. General:
 - a. Lines and grades:
 - 1) Construct backfills, embankments, fills, and road fills, at locations and to lines and grades indicated on the Drawings.
 - 2) Overbuild permanent fill slopes by at least 1 foot and then cut to final grade to provide adequate compaction of the remaining fill.
2. Backfills:
 - a. Place loose material in successive layers that do not exceed 8 inches in depth before compaction.
 - b. Bring each layer to a moisture content 2 percent above or below optimum moisture content before compacting.
 - c. Defective compacted backfills: Remove and recompact.
3. Fills:
 - a. Place loose material in successive layers that do not exceed 8 inches in depth before compaction.
 - b. Bring each layer to a moisture content 2 percent above or below optimum moisture content before compacting.
 - c. Defective compacted fills: Remove and recompact.
4. Coarse fill:
 - a. When materials are coarsely graded so that performance of field density tests are impossible:
 - 1) Placement and compaction: Place material in lifts so as to obtain compacted thickness of 6 inches and roll with pneumatic roller or power roller.
 - 2) Moisture content: Provide moisture content of fraction of material passing 3/4-inch sieve within plus or minus 2.0 percent of optimum moisture as determined in accordance with ASTM D1557, Method C.
5. Embankments:
 - a. Place loose material in successive layers that do not exceed 8 inches in depth before compaction.
 - b. Bring each layer to a moisture content 2 percent above or below optimum moisture content before compacting.
 - c. Defective compacted embankments: Remove and recompact.
6. Roadway fills:
 - a. Place loose material in successive layers that do not exceed 8 inches in depth before compaction.
 - b. Bring each layer to a moisture content 2 percent above or below optimum moisture content before compacting.
 - c. Defective compacted roadway fills: Remove and recompact.

- G. Topsoil requirements in agricultural areas:
1. When staging areas are no longer required by the Contractor, Construction Manager and others, all temporary gravel, snow fence, trash, construction materials, etc. shall be removed.
 2. Upon staging area removal, Contractor shall rough grade entire agricultural area in accordance with this Section.
 - a. Contractor shall match existing irrigation zones, which currently split the field into 3 sections with a small berm.
 3. After damaged agricultural area has been rough graded, topsoil shall be placed back onto the roughly graded area, matching the depth determined by the agronomist.
 - a. Contractor shall hire an agronomist to observe topsoil placement and submit certification topsoil has been satisfactorily replaced.
 - b. For bid purposes, Contractor shall assume a depth of 12 inches.
 4. After topsoil has been replaced, Contractor shall hire a professional land leveler to perform grading with laser levelling control and/or GPS control to restore grading in entire agricultural area to approximately match pre-construction grading.
 - a. Approximate downhill slope is 0.1 percent from the east to west.
 - b. Professional land leveler shall have minimum 10 years of experience performing fine grading on similar sized areas within the region.
 5. Topsoil shall be compacted to between 85 and 90 percent relative compaction.

3.04 FIELD QUALITY CONTROL

- A. Confirmation tests:
1. Confirmation tests will be performed and paid for by the Construction Manager.
 2. Contractor's responsibilities:
 - a. Adequacy of compaction equipment and procedures:
 - 1) Demonstrate adequacy of compaction equipment and procedures.
 - 2) At each test location include tests for each type or class of backfill from bedding to finish grade.
 - b. Compaction sequence requirements:
 - 1) Do not perform additional earthwork of the same kind until specified degree of compaction has been demonstrated.
 - ~~c. Cost of confirmation tests: Paid for by the Contractor.~~
 - ~~c. Cost of re-testing for failed confirmation tests:
 - 1) Paid for by the Contractor per Section 01450.^{AD3}~~
 - d. Qualifications of Contractor's testing laboratory: Acceptable to Engineer.
 - e. Copies of confirmation test reports: Submit promptly to the Engineer.
 3. Frequency of confirmation testing:
 - a. In-place density:
 - 1) Backfill, fill, and embankments: Every 1 foot of vertical lift.
 - 2) Roadway fills: Every 10 cubic yards.
 - b. Maximum dry density versus moisture:
 - 1) Backfill, fill, and embankments: Every 1 foot of vertical lift.
 - 2) Roadway fills: Every 10 cubic yards.
 - c. Cost of ~~re-testing for failed~~^{AD3} confirmation tests:
 - 1) Paid for by the Contractor ~~per Section 01450~~^{AD3}.
 - d. Copies of confirmation test reports: Saved in the project files for record and provided to Engineer if required compaction is not met.

B. Tolerances:

1. Finish grading of backfills, cuts, embankments, fills, and roadway fills:
 - a. Perform fine grading under concrete structures such that finish surfaces are never above the grade or cross section indicated on the Drawings and are never more than 0.10 feet below.
 - b. Provide finish surface for areas outside of structures that are within 0.10 feet of grade or cross section indicated on the Drawings.
2. Unlined channels and basins:
 - a. In both cut and fill, and levee and access road side slopes in cut: Vertical tolerance of none above and 3 inches below grade indicated on the Drawings on bottom and side slopes.
 - b. On top surface of levee and access road in both cut and fill, and levee and access road side slopes in fill: Vertical tolerance of none below and 3 inches above grade indicated on the Drawings.
3. Areas which are not under structures, concrete, asphalt, roads, pavements, sidewalks, dikes, and similar facilities:
 - a. Provide finish graded surfaces of either undisturbed soil, or cohesive material not less than 6 inches deep.
 - b. Intent of proceeding is to avoid sandy or gravelly areas.
4. Finish grading of surfaces:
 - a. Reasonably smooth, compacted, and free from irregular surface changes.
 - b. Provide degree of finish that is ordinarily obtainable from blade grader operations, except as otherwise specified.
 - c. Uniformly grade areas that are not under concrete.
 - d. Finish ditches and gutters so that they drain readily.

3.05 ADJUSTING

A. Finish grades of excavations, backfills, and fills:

1. Repair and reestablish grades to required elevations and slopes due to any settlement or erosion that may occur from action of the elements or any other cause prior to final acceptance.

3.06 PROTECTION

A. Finish grades of backfills, cuts, excavations, and fills:

1. Protect newly graded areas from erosion and deterioration by action of the elements.

B. Ditches and gutters:

1. Maintain ditches and gutters free from detrimental quantities of debris that might inhibit drainage until final acceptance.

END OF SECTION

AD3 Addendum No. 3

SECTION 02318

TRENCHING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Trench excavation and trench backfill for pipelines, manholes, vaults, and appurtenances.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. D698-Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³).
 - 2. D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method.
 - 3. D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³).
 - 4. D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.03 SUBMITTALS

- A. As specified in Section 01330 - Submittal Procedures.
- B. Product data on soils and aggregates.
 - 1. Material source.
 - 2. Gradation.
 - 3. Test data to demonstrate compliance with requirements as specified in this Section.
- C. Samples:
 - 1. Provide 50-pound sample of materials when requested by the Engineer.
- D. Confirmation testing:
 - 1. Certification of Contractor's testing laboratory.
 - 2. Record copy report for tests performed by Contractor's testing laboratory.

1.04 DEFINITIONS

- A. Backfill: Material placed in trench above the pipe embedment zone.
- B. Bedding: Material placed under, around, and over pipes or ducts in trenches.
- C. Fine grading: bedding material placed directly below pipes or ducts to provide support at the bottom of the trench and to bring those elements to required grades and elevations.

- D. Pipe foundation: Stabilization material placed at the bottom of trench to provide support when the trench bottom is not firm, dry or uniform.
- E. Pipe embedment zone: Includes bedding, fine grading, and haunch zone.
- F. Haunch zone: Material placed below and beside the pipe up to the pipe springline.
- G. Pipe springline: A horizontal reference line located at mid-height, or halfway point, of a circular conduit, pipe, or tunnel. It is the maximum horizontal dimension or diameter of a circular conduit, pipe, or tunnel.
- H. Rigid pipe: Includes reinforced non-cylinder concrete, reinforced concrete cylinder, prestressed concrete cylinder, vitrified clay, polymer concrete, cast iron, asbestos cement and cast-in-place pipes.
- I. Flexible pipe: Includes steel, ductile iron, thermoplastics such as polyvinyl chloride (PVC) and high-density polyethylene (HDPE), thermosetting plastics such as fiberglass-reinforced polymer (FRP), bar-wrapped concrete cylinder pipe, and corrugated steel pipes.
- J. Haunch zone: Material placed below and beside the pipe up to the pipe springline.
- K. Lift: A layer of soil or aggregate material, measured before compaction.
- L. Maximum density, laboratory compaction: Soil maximum density and optimum water content when tested in accordance with ASTM D1557.
- M. Maximum density, field compaction: Soil density and water content when tested in accordance with ASTM D6938.
- N. Pavement section: Includes pavement plus underlying courses such as base course and subgrade.
- O. Pipe embedment zone: Includes bedding, fine grading, and haunch zone.
- P. Pipe foundation: Material placed at the bottom of trench to provide support.

PART 2 PRODUCTS

2.01 MATERIALS

- A. As specified in Section 02050 - Soils and Aggregates for Earthwork.
- B. Class C concrete: As specified in Section 03300 - Cast-in-Place Concrete.
- C. Controlled low-strength material: As specified in Section 02312 - Controlled Low Strength Material (CLSM).

PART 3 EXECUTION

3.01 PREPARATION

- A. Stabilize excavations as specified in Section 02260 - Excavation Support and Protection.
- B. Perform subsurface utility engineering (SUE) for utility locating and verification prior to any excavation work and as specified in Section 02280 - Subsurface Utility Engineering.

3.02 DEWATERING

- A. As specified in Section - 02241 - Dewatering - Linear Infrastructure.

3.03 TRENCH EXCAVATION

- A. Excavate bottom of trench to depth indicated on the Drawings.
- B. Areas of new fill or embankment:
 - 1. Prior to laying pipes or electrical service, place fill and compact as specified to not less than 2 feet above top of pipe, conduit, or duct bank.
 - 2. Excavate through fill for pipe trench.
- C. Trench widths as specified in the following table:

Buried Pipe Or Accessory	Minimum Trench Width	Maximum Trench Width
Nominal Pipe Diameter: 4 inch to 24 inch	OD + 18 inches	OD + 24 inches
Nominal Pipe Diameter: 4 inch to 24 inch with CLSM placed in pipe embedment zone	OD + 12 inches	OD + 24 inches
Nominal Pipe Diameter: Greater than 24 inch	OD + 24 inches	OD + 36 inches
Nominal Pipe Diameter: Greater than 24 inch with CLSM placed in pipe embedment zone	OD + 12 inches	OD + 36 inches
Manholes, vaults, valves, or other accessories	12 inches between outer surface and trench side or shoring	Not applicable

- D. Potable water pipe and appurtenances:
 - 1. Lay in trenches separate from those used for sewers and recycled water.
 - 2. Unless otherwise specified or indicated on the Drawings, lay in trenches having cover of not less than 3 feet below surface of ground located at distance of not less than 10 feet clear horizontally from any parallel sewer and 1 foot clear vertically above any parallel sewer.

- E. At road crossings or existing driveways:
 - 1. Provide notification, vehicular access, and traffic control as required by permits and special conditions.
 - 2. Provide temporary asphalt or plating for traffic or access at the end of each work day unless approved in writing by Construction Manager.
 - 3. If unexpected utility conflicts or changed site conditions require trenchless technologies or temporary bridges, immediately notify the Construction Manager in writing. Approval is required before proceeding with construction.
 - 4. When trench width at top of pipe is increased beyond width specified in this Section because of soil conditions, safety requirements, or other reasons, Engineer approval for remedy is required without additional cost to Owner.
 - a. Remedy may include upgrade laying conditions or install stronger pipe designed in accordance with Specifications.

3.04 TRENCH BACKFILL - GENERAL

- A. Trench area terminology and locations as indicated on the Drawings.
- B. Place material, except CLSM and concrete, in maximum 6 inch lifts, measured before compaction.
- C. Backfilling of manhole excavation: Conform to backfilling requirements for trenches as specified in this Section.

3.05 PIPE FOUNDATION

- ~~A. Provide trench bottom with firm, dry, uniform bearing surface at the grade indicated on the Drawings.~~
- ~~B. Excess excavation below elevation indicated on the Drawings will require installation of pipe foundation material to bring the trench bottom back to the elevation indicated on the Drawings at no additional cost to Owner.
 - 1. Materials and placement.~~
- ~~C. If bottom of trench excavation consists of soil:
 - 1. Scarify bottom of trench to a depth of 6 inches below the grade indicated on the Drawings.
 - 2. Materials and placement:
 - a. Recompact scarified material to 95 percent of maximum density.~~
- ~~D. If bottom of trench excavation consists of rock or any material that, by reason of its hardness, cannot be excavated to provide uniform bearing surface:
 - 1. Remove such rock or other material to a depth of not less than 4 inches below pipe embedment zone.
 - 2. Materials:
 - a. CLSM.
 - b. Class C concrete.~~
- ~~E. If bottom of trench excavation consists of mud or other soft unstable material:
 - 1. Confirm with Construction Manager if mud or other soft unstable material is present.~~

- ~~2. Remove such unacceptable material to a depth of not less than 18 inches below pipe embedment zone.~~
- ~~3. Material and placement:~~
 - ~~a. Aggregate base course compacted to 95 percent maximum dry density.~~
- A. Provide trench bottom with firm, dry, uniform bearing surface to the bottom of fine grading.
- B. Excess excavation shall be replaced with fine grading material.
- C. If bottom of trench excavation consists of soil:
 - 1. Leave bottom of trench as undisturbed soil.
 - 2. If soil is inadvertently disturbed, recompact disturbed soil to 95 percent maximum density.
- D. If bottom of trench excavation consists of rock or any material that, by reason of its hardness, cannot be excavated to provide uniform bearing surface:
 - 1. Confirm with Construction Manager if revision to pipe foundation is required.
 - 2. Remove such rock or other material to below the fine grading and replace voids with one the following materials:
 - a. Fine Grading Material
 - b. CLSM.
 - c. Class C concrete.
- E. If bottom of trench excavation consists of mud or other soft unstable material:
 - 1. Confirm with Construction Manager if revision to pipe foundation is required.
 - 2. Install a crushed rock pipe foundation per typical detail CP113.^{AD3}

3.06 PIPE EMBEDMENT ZONE

- A. Pipe displacement:
 - 1. Take necessary precautions in placement and compaction of bedding material to prevent displacement of piping.
 - 2. In event there is movement or floating of the piping, re-excavate, re-lay, and backfill the pipe.
- B. Fine grading:
 - 1. Place 6-inches of ~~pipe embedment zone material~~ ABC compacted to 95 percent maximum dry density^{AD2} from the trench bottom to the bottom of the pipe or duct to provide support at the bottom of the trench and to bring those elements to required line and grade. Where CLSM is used for the pipe embedment zone per detail CP112, CLSM may be used as fine grading as shown in detail CP112.^{AD2}
- C. Depressions for joints or couplings:
 - 1. Excavate holes in the fine grading material at the bottom of the trench.
 - 2. Provide holes of sufficient width to provide ample room for grouting, banding, or welding as necessary for making joints and to ensure that pipe rests upon prepared trench bottom and not supported by any portion of the joint.

- D. Rigid pipe:
1. Pipe embedment zone: Below pipe springline:
 - a. Materials and placement:
 - 1) Aggregate base course compacted to 95 percent maximum dry density.
 - 2) CLSM. Place gravel bags to support and set pipe to line and grade prior to CLSM placement. Place CLSM in lifts as necessary to prevent floatation.
 2. Pipe embedment zone: Above pipe springline:
 - a. Compacted to a depth above pipe: 12-inch minimum.
 - b. Materials and placement:
 - 1) Aggregate base course compacted to 95 percent maximum dry density.
 - 2) CLSM. Place gravel bags to support and set pipe to line and grade prior to CLSM placement. Place CLSM in lifts as necessary to prevent floatation.

- E. Steel Pipe:
1. Pipe embedment zone:
 - a. Compacted to a depth above pipe: 12-inch minimum.
 - b. Materials and placement:
 - 1) CLSM. Place gravel bags to support and set pipe to line and grade prior to CLSM placement. Place CLSM in lifts as necessary to prevent floatation.

- F. Ductile Iron Pipe in Stanislaus County Right-of-Way:
1. Pipe embedment zone:
 - a. Compacted to a depth above pipe: 12-inch minimum.
 - b. Materials and placement:
 - ~~1) Native compacted to 95 percent maximum dry density.~~
 - 1) Native material per Section 02050 compacted to 95 percent maximum dry density.
 - a) Native material for the pipe embedment zone does not need to meet the plasticity index requirements per Section 02050 Part 2.02-A.4. and corrosion resistance requirements per Section 02050 Part 2.02-A.5.^{AD2}
 - 2) ABC compacted to 95 percent maximum dry density.
 - 3) CLSM. Place gravel bags to support and set pipe to line and grade prior to CLSM placement. Place CLSM in lifts as necessary to prevent floatation.

- G. Ductile Iron Pipe in City of Turlock Right-of-Way or Project Site:
1. Pipe embedment zone:
 - a. Compacted to a depth above pipe: 12-inch minimum.
 - b. Materials and placement:
 - ~~1) Native compacted to 95 percent maximum dry density.~~
 - 1) Native material per Section 02050 compacted to 95 percent maximum dry density.
 - a) Native material for the pipe embedment zone does not need to meet the plasticity index requirements per Section 02050 Part 2.02-A.4. and corrosion resistance requirements per Section 02050 Part 2.02-A.5.^{AD2}

- 2) ABC compacted to 95 percent maximum dry density.
- 3) CLSM. Place gravel bags to support and set pipe to line and grade prior to CLSM placement. Place CLSM in lifts as necessary to prevent floatation.

H. Flexible Pipe Other Than Steel or Ductile Iron:

1. Pipe embedment zone:
 - a. ABC compacted to 95 percent maximum dry density.
 - b. CLSM. Place gravel bags to support and set pipe to line and grade prior to CLSM placement. Place CLSM in lifts as necessary to prevent floatation.

3.07 BACKFILL

A. Trenches:

1. Stanislaus County Right-of-Way:
 - a. Materials and placement:
 - ~~1) Native compacted to 95 percent maximum dry density.~~
 - 1) Native material per Section 02050 compacted to 95 percent maximum dry density.
 - a) Native material for the backfill does not need to meet the plasticity index requirements per Section 02050 Part 2.02-A.4. and corrosion resistance requirements per Section 02050 Part 2.02-A.5.^{AD2}
 - 2) ABC compacted to 95 percent maximum dry density.
 - 3) CLSM.
2. City of Turlock Right-of-Way or Project Site:
 - a. Materials and placement:
 - ~~1) Native compacted to 95 percent maximum dry density.~~
 - 1) Native material per Section 02050 compacted to 95 percent maximum dry density.
 - a) Native material for the backfill does not need to meet the plasticity index requirements per Section 02050 Part 2.02-A.4. and corrosion resistance requirements per Section 02050 Part 2.02-A.5.^{AD2}
 - 2) ABC compacted to 95 percent maximum dry density.
 - 3) CLSM.

B. Trenches in rock:

1. Backfill to top of rock.
 - a. Materials and placement:
 - 1) CLSM.
 - 2) Class C concrete.
2. Backfill from top of rock to grade, if applicable:
 - a. Materials and placement:
 - 1) Aggregate base course compacted to 95 percent of maximum density.

- C. Trenches below or within 10 feet of the outside perimeter of structures:
 - 1. Unless shown on Drawings to encase in concrete, backfill to underside of aggregate base course below structure.
 - 2. Materials and placement:
 - a. Aggregate base course compacted to 95 percent of maximum density.
 - b. CLSM.
- D. Trenches under existing intersecting pipes, duct banks, or conduits larger than 3 inches in diameter:
 - 1. Backfill from above top of new pipe embedment zone to springline of intersecting pipe or conduit.
 - a. Extend backfill at least 2 feet on either side of intersecting pipe or conduit to ensure backfill material remains in place while other backfill is being placed.
 - b. Materials and placement:
 - 1) CLSM, unless otherwise indicated on the Drawings.
 - 2. Backfill remainder of trench:
 - a. Materials and placement:
 - 1) CLSM.

3.08 EXCESS MATERIAL

- A. Remove excess excavated material from the Project site as specified in Section 02300 - Earthwork.

3.09 FIELD QUALITY CONTROL

- A. Provide field quality control for the Work as specified in Section 01450 - Quality Control.
- B. Confirmation tests: As specified in Section 02300 - Earthwork.
 - 1. Construction Manager shall perform and pay for confirmation testing.
 - 2. Minimum frequency of confirmation testing:
 - a. At each test location include tests for each type or class of backfill from bedding to finished grade.
 - b. CLSM – see section 02312.
 - c. For trenches: Each type of material and at least every 50 linear feet at multiple depths as determined by the Construction Manager.
- C. Compliance tests:
 - 1. The City may perform periodic compliance tests to verify that compaction is meeting requirements as specified in this Section.
 - 2. Perform remedial work if compaction test fails to meet specified requirements using one of the following methods:
 - a. Remove and replace backfill at the proper density.
 - b. Other means acceptable to the Construction Manager.
 - 3. Retesting:
 - a. Costs of retesting: Contractor is responsible for the costs of retesting required to confirm and verify that remedial work has brought compaction within specified requirements.

- b. Contractor's confirmation tests during performance of remedial work:
 - 1) Performance: Perform tests in manner acceptable to the Construction Manager.
 - 2) Frequency: Double amount specified for initial confirmation tests.

D. Piping system testing:

- 1. As specified in Section 15956 - Piping Systems Testing.

END OF SECTION

^{AD3} Addendum No. 3

^{AD2} Addendum No. 2

SECTION 02600
CONCRETE MANHOLES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Manhole frames and covers.
 - 2. Manhole grade rings.
 - 3. Manholes cones and risers.
 - 4. Manhole bases.

1.02 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO).
 - 1. Standard Specifications for Highway Bridges.
- B. ASTM International (ASTM):
 - 1. A48 - Standard Specification for Gray Iron Castings.
 - 2. C33 - Standard Specification for Concrete Aggregates.
 - 3. C150 - Standard Specification for Portland Cement.
 - 4. C443 - Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets.
 - 5. C478 - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
 - 6. C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint.
 - 7. C923 - Standard Gide for In-Plant Performance Evaluation of Automatic Pedestrian SNM Monitors.
 - 8. C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.
- C. International Organization of Standardization (ISO):
 - 1. 9001 - Quality Management Standard.

1.03 SUBMITTALS

- A. Submit as specified in Section 01330 - Submittal Procedures.
- B. Shop drawings:
 - 1. Manufacturer's catalog data and details of following items for approval:
 - a. Frame and covers.
 - b. Grade rings.
 - c. Manhole cones and risers.
 - d. Manhole bases, if precast.
 - 2. Manhole construction details, jointing methods, connection details, materials, and dimensions.
 - 3. Repair procedures and details.

- C. Calculations and criteria used in manhole design including material properties, loadings, load combinations, and dimensions assumed.
- D. Test methods and results including certification that the manhole riser exceeds the minimum requirements in accordance with ASTM C478.
- E. Sealed drawings and design calculations by a registered Professional Engineer licensed in the State where the project is located.
- F. Certificates:
 - 1. ISO 9001 certificate by a third party confirming that ASTM test reports are valid and up to date at the time of the bid and during construction period.
 - 1. Manufacturer's Certificate of Source Testing.

1.04 PRODUCT REQUIREMENTS

- A. As specified in Section 01600 - Product Requirements.
- B. Provide suitable quantities of lifting equipment to handle the manholes/risers and castings.
 - 1. In no case shall any equipment be used that is not rated to handle the intended loading or conditions of use to which it will be subjected, or which will damage or gouge the manhole components.
 - 2. Dragging or dropping the manhole components shall not be allowed.
- C. Source testing.
 - 1. Perform pre-production and post-production tests by manufacturer staff with a minimum of 5 years of experience in quality control, inspection, and testing of manholes.
 - a. In lieu of this experience, witness of tests by up to 3 full-time Owner representatives.
 - 2. Examine each completed manhole section for dimensional requirements, strength, and workmanship.
 - 3. Complete required testing in accordance with ASTM C478.
 - 2. Provide the Manufacturer's Certificate of Source Testing.

1.05 DESIGN CRITERIA:

- A. Manholes shall not include steps.
- B. Manhole lids: Locking type.
- C. Manhole bases:
 - 1. Constructed as part of the pipe installation or using tee risers.
- D. Manhole riser:
 - 1. Made of the same pipe material selected for the project, providing a sealed connection between the pipe base and riser as indicated on the Drawings.
 - 2. Manufactured specifically for this project and no materials shall be furnished from stock unless approved by the Engineer.
- E. Manhole provider shall coordinate with the pipe manufacturer for dimensions and connections.

- F. Manhole systems:
 - 1. Provided by a single manufacturer.
- G. Frames and covers:
 - 1. Provided by a single manufacturer unless approved by the Engineer.

1.06 WARRANTY

- A. As specified in Section 01783 - Warranties and Bonds.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manhole grade rings, cones, and risers: One of the following or equal.
 - 1. Oldcastle Infrastructure.
 - 2. Jensen Precast.
- B. Manhole frames and covers: Manufacturers: One of the following or equal.
 - 1. Alhambra Foundry Company.
 - 2. Neenah Foundry Company.

2.02 BASIS OF DESIGN

- A. Design in accordance with local jurisdiction requirements, including but not limited to the following:
 - 1. Manhole frames and covers.
 - 2. Manhole diameter tolerance.
 - 3. Manhole length.
 - 4. Manhole cover bolting.
 - 5. Manhole backfill.
- B. Structural design calculations:
 - 1. Load rating of manhole:
 - a. Design to support an AASHTO Standard Specifications for Highway Bridges, H-20 vehicle loading.
 - 2. Resist buoyancy:
 - a. Design with sufficient bottom anchorage and side friction to resist buoyancy.
 - b. Depths will be as indicated on the Drawings.
 - c. Refer to the geotechnical report for soil condition including fully saturated soil conditions.
- C. Manholes, grade rings, risers, and bases:
 - 1. Manhole:
 - a. Nominal sizes as indicated on the Drawings.
 - 2. Grade rings:
 - a. At least 1 but not more than 2 grade rings shall be used.
 - b. Maximum total distance from top of cone section to final grade: 18 inches.
 - 3. Cone and riser sections:
 - a. As specified in this Section and as indicated on the Drawings.
 - b. Cone sections shall be eccentric.

4. Manhole bases:
 - a. As specified in this Section and as indicated on the Drawings.
 - ~~b. Provide corrosion protection system on unlined concrete.~~^{AD3}

- D. Threaded lifting inserts:
 1. Design inserts to be fully threaded:
 - a. Do not fully penetrate through entire manhole wall.
 2. Provide lifting device compatible with spreader bar and chains, hooks and slings.
 3. Design with minimum safety factor of 4.0.
 4. Do not use reinforcing steel bars.

2.03 MATERIALS

- A. Cast iron manhole frames and covers.
 1. In accordance with ASTM A48.
 2. Covers: Bolted as specified.
 3. Concrete collars: As indicated on the Drawings.
- B. Manhole bases, risers, and grade rings:
 1. Cement: Type II or Type V portland cement in accordance with ASTM C150.
 2. Concrete aggregates: In accordance with ASTM C33, gradation as specified in approved mix design.
 3. Sections: Steel reinforced.
 4. Precast concrete sections: Manufactured by a process that will produce a dense, homogeneous concrete ring.
 5. Top and bottom of sections: Parallel.
- C. Joint sealant:
 1. Preformed, cold applied flexible joint sealant in accordance with ASTM C990 and ASTM C443.
 2. Manufacturers: One of the following or equal.
 - a. Henry Corp., Ram-Nek.
 - b. Kent Seal - Hamilton Kent Corp.

2.04 COMPONENTS

- A. Pipe stubs:
 1. Provide pipe stubs at manhole locations and in accordance with details indicated on the Drawings and as specified.
 2. Plugging stubs:
 - a. Plug stubs with vitrified clay stopper, brick plug, or other materials as indicated on the Drawings.
 - b. Unless otherwise indicated on the Drawings, comply with following:
 - 1) Stubs up to and including 21 inches: Vitrified clay stoppers.
 - 2) Stubs greater than 21 inches: Brick plugs.
- B. Resilient pipe connectors:
 1. Unless otherwise indicated on the Drawings or specified, provide a flexible compression type connector between manhole and pipes entering and leaving the manhole in accordance with ASTM C923.

2. Resilient pipe connectors:
 - a. Manufacturers: The following or equal.
 - 1) A-LOK Premium.
- C. Threaded lifting inserts.
- D. Drop manholes:
 1. Construct drop manholes at locations and in accordance with details indicated on the Drawings.
 2. Provide inside diameter of drop inlet pipe the same as intercepted sewer unless otherwise indicated on the Drawings or specified in this Section.
 3. Furnish and set fittings as indicated on the Drawings.

2.05 IDENTIFICATION MARKINGS

- A. Identification marks on the exterior of bases, risers, grade rings, and include the following information:
 1. Date of manufacture of the item.
 2. Name or trademark of the manufacturer.
 3. Internal diameter in inches.
 4. Number of the manhole as indicated on the Drawings.

2.06 QUALITY CONTROL

- A. Manufacturer to provide permanent quality control department and laboratory facility capable of performing inspections and testing as specified by this Section.
- B. Material testing, inspection procedures, and manufacturing process are subject to inspection by the Owner or Owner's representative.
- C. Perform manufacturer's tests and inspections in accordance with the referenced standards and as specified in this Section including the following:
 1. Provide the Manufacturer's Certificate of Source Testing as specified in Section 01600 - Product Requirements.
 2. Manufacturer shall make available services of representative throughout the project duration when deemed necessary by the Engineer.
 3. Calibrate within last 12 months for equipment such as scales, measuring devices and calibration tools used in the manufacturing of pipe.
 - a. Each device used in the manufacture of manholes is required to have a tag recording date of last calibration.
 - b. Devices are subject to inspection by Engineer.
- D. Furnish labor necessary to assist the Engineer in inspecting manholes upon delivery.
- E. Remove rejected manholes immediately.

PART 3 EXECUTION

3.01 MANHOLE INSTALLATION

- A. Excavate and backfill as specified in Section 02318 - Trenching and as indicated on the Drawings.
- B. Maintain identification markings on installed pieces throughout installation.
- C. Do not use sections with chips or cracks in the joint.
- D. Engineer may inspect manhole sections, prior to installation.
- E. Repair of manhole sections damaged during installation in accordance with manufacturer's repair procedures; with the concurrence of the Engineer.
- F. Install joint sealant material in accordance with manufacturer's instructions:
 - 1. Completed manhole: Rigid and watertight.
- G. Fill threaded lifting inserts with grout.
- H. Lay grade rings on joint sealant with sides plumb and tops level.
- I. Set frame and covers as specified and as indicated on the Drawings.
- J. Apply damproofing as specified in Section 07164 and as indicated on the Drawings.
 - 1. Apply material in accordance with manufacturer recommendations over the entire exterior surface of the completed manhole, including base section, riser sections, cone section, and grade rings prior to backfilling the manhole.
 - 2. Allow waterproofing material to dry sufficiently before backfilling.

3.02 CLEANING

- A. After completing each manhole, remove debris, construction materials, and equipment from the site of the work, grade, and smooth over the surface and leave the entire right-of-way in a clean, neat, and serviceable condition.
- B. After completing each manhole, remove construction material debris from inside the manhole.

3.03 FUNCTIONAL TESTING

- A. Provide materials for grouting and patching recommended by the manufacturer or an approved equal.
- B. Vacuum testing in accordance with ASTM C1244.
 - 1. Install the vacuum test head on top of the manhole.
 - a. Install and brace sealing devices on influent and effluent pipes.
 - 2. Draw a vacuum of 10 inches of mercury with a vacuum pump, deactivate the pump, and measure the actual elapsed time for the vacuum to drop to 9 inches of mercury.

3. Compare test results with the minimum time requirements stated in the table below.
 - a. If the actual elapsed time is less than the time in the table, the manhole is defective, and it shall be repaired and retested until it is acceptable.

<u>Minimum Elapsed Time, Minutes: Seconds</u>				
Manhole Depth, ft.	Manhole Diameter, inches			
	36	48	60	72
8	0:14	0:20	0:26	0:33
10	0:18	0:25	0:33	0:41
12	0:21	0:30	0:39	0:49
14	0:25	0:35	0:46	0:57
16	0:28	0:40	0:52	1:07
18	0:32	0:45	0:59	1:13
20	0:35	0:50	1:05	1:21
22	0:38	0:55	1:12	1:29
24	0:42	0:59	1:18	1:37
26	0:46	1:04	1:25	1:45
28	0:49	1:09	1:31	1:53
30	0:53	1:14	1:38	2:01

END OF SECTION

AD3 Addendum No. 3

SECTION 02742A

ASPHALTIC CONCRETE PAVING (CA)

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Asphalt pavement on prepared subgrade or aggregate base course to lines, grades, and compacted thickness as indicated on the Drawings.
- B. Paving in Stanislaus County shall comply with Stanislaus County requirements. Requirements in this section are only supplementary to Stanislaus County requirements and do not supersede Stanislaus County requirements.
- C. Paving in the City of Turlock shall comply with City of Turlock Requirements. Requirements in this section are only supplementary to City of Turlock requirements and do not supersede City of Turlock requirements.
- D. Paving in other areas shall comply with these requirements.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft. lbf/f₄³)(2,700 kN-m/m³).
 - 2. D1561 - Standard Practice for Preparation of Bituminous Mixture Test Specimens by Means of California Kneading Compactor.
- B. Caltrans Standard Test Methods:
 - 1. Calif Test 202 - Sieve Analysis of Fine and Coarse Aggregates.
 - 2. Calif Test 304 - Preparation of Bituminous Mixtures for Testing.
 - 3. Calif Test 362 - Determining Asphalt Content in Bituminous Mixtures by Vacuum Extraction.
 - 4. Calif Test 375 - Determining the In-Place Density and Relative Compaction of AC Pavement.
 - 5. Calif Test 379 - Determining Asphalt Content in Bituminous Mixtures (Troxler Nuclear Gauge Model 3241).
- C. State of California Department of Transportation Standard Specifications, ~~latest~~ 2010^{AD3} edition (Caltrans Standard Specifications), unless specifically noted otherwise^{AD3}:
 - 1. Section 37 - Bituminous Seals.
 - 2. Section 39 - Hot Mix Asphalt.
 - 3. Section 88 - Geosynthetics.
 - 4. Section 92 - Asphalts.
 - 5. Section 93 - Liquid Asphalts.
 - 6. Section 94 - Asphaltic Emulsions.

1.03 DEFINITIONS

- A. "Asphalt Concrete" as used by Caltrans shall be considered the "Surface Course," or the final lift of the pavement section.
- B. "Asphalt Concrete Base" as used by Caltrans shall be the remaining portion of the asphalt pavement section excluding the final lift.
- C. "Asphalt Pavement" shall be the total pavement section of asphalt including Asphalt Concrete and Asphalt Concrete Base.

1.04 SUBMITTALS

- A. Mix design.
- B. Shop drawings.
- C. Product data:
 - 1. Asphalt.
 - 2. Asphalt aggregate.
 - 3. ~~Pavement reinforcing fabric.~~^{AD3}
- D. Quality control submittals:
 - 1. Test results.
 - 2. Certificate of Compliance.
 - 3. Certificate of Competence.
- E. Equipment list.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Asphalt pavement delivery:
 - 1. Transport the mixture from the mixing plant to the point of use in vehicles having tight bodies previously cleaned of foreign materials.
 - 2. Treat bodies as necessary to prevent material from sticking to the bodies.
 - 3. Cover each load with canvas or other suitable material of sufficient size and thickness to protect the asphalt mixture from the weather.

1.06 PROJECT CONDITIONS

- A. Environmental requirements:
 - 1. Asphalt concrete:
 - a. Place asphalt concrete only when surface is dry, and when atmospheric temperature in the shade is 40 degrees Fahrenheit and rising, or above 50 degrees Fahrenheit if falling.
 - b. Do not place asphalt concrete when weather is foggy or rainy, when base on which material is to be placed is in wet or frozen conditions, or when, in the opinion of the Engineer, weather conditions will prevent proper handling, finishing, or compaction of the mixtures.

2. Prime coat:
 - a. Do not apply prime coat when atmospheric temperature is below 60 degrees Fahrenheit.
 - b. Apply prime coat only when base course is dry or contains moisture not in excess of that which will permit uniform distribution and desired penetration.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. This Work shall consist of furnishing and mixing aggregate and asphalt binder at a central mixing plant, spreading and compaction of the mixture as specified and as indicated on the Drawings.
- B. In general, asphalt concrete and asphalt concrete base shall conform to Section 39 "Hot Mix Asphalt," and applicable referenced sections of the Caltrans Standard Specifications:
 1. Where conflicts exist, this specification shall govern.

2.02 ASPHALT PAVEMENT MATERIALS

- A. Asphalts:
 1. Asphalt binder: Steam-refined paving asphalt, ~~PG 64-10~~ PG 70-10^{AD3}, conforming to Section 92 ~~1.02C "Grades"~~^{AD3} of the Caltrans Standard Specifications.
 2. Prime coat and tack coat: Grade SC-70, conforming to Section 93 of the Caltrans Standard Specifications.
- B. Asphalt aggregate:
 1. Aggregate for asphalt concrete shall conform to Section 39-1.02E of the Caltrans Standard Specifications for ~~Type B~~ Type A^{AD3} grading, 1/2-inch maximum, medium.
 2. Aggregate for asphalt concrete base shall conform to Section 39-1.02E of the Caltrans Standard Specifications for ~~Type B~~ Type A^{AD3} grading.
 3. ~~The use of reclaimed asphalt pavement (RAP) in asphalt concrete and asphalt concrete base is prohibited.~~^{AD3}
- C. Asphalt pavement shall be produced in a batch mixing plant, a continuous pugmill mixing plant, or dryer-drum mixing plant:
 1. Proportioning shall conform to Section 39-3.03 of the Caltrans Standard Specifications.
 2. Mixing shall conform to Section 39-3.04 of the Caltrans Standard Specifications.

2.03 SLURRY SEAL

- A. Slurry seal, Type II, shall be applied in conformance with the provisions in Section 37-2, and applicable referenced sections of the Caltrans Standard Specifications.

2.04 AGGREGATE BASE COURSE

- A. Aggregate base course: As specified in Section 02050 - Soils and Aggregates for Earthwork.
- B. Compacted thickness of aggregate base course shall be as indicated on the Drawings.

2.05 EQUIPMENT

- A. Spreading and compacting equipment:
 - 1. Spreading equipment shall conform to Section 39-1.10 and applicable referenced sections of the Caltrans Standard Specifications:
 - a. Only in areas inaccessible to the machine, by approval of the Engineer, will hand spreading be permitted.
 - 2. Compaction equipment shall conform to Section 39-1.10 and applicable referenced sections of the Caltrans Standard Specifications.

2.06 SOURCE QUALITY CONTROL

- A. The Construction Manager will perform sampling and tests of materials in accordance with California Test Method Number 304 and California Test Method Number 362 or 379, as applicable. Samples will be taken from materials as delivered to the site.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions: Verify surfaces and site conditions are ready to receive work. If unsatisfactory conditions exist, do not commence installation until such conditions have been corrected. Beginning application means acceptance of existing conditions.

3.02 PREPARATION

- A. Protection:
 - 1. Protect concrete pavements and walks, curbs and bases, and other improvements adjacent to the operations with suitable materials.
 - 2. Building and other surfaces shall be covered with paper or other protection, when required.
 - 3. Contractor shall be responsible for any damage caused by Contractor's employees. Damage caused by the Contractor's operations shall be repaired to the satisfaction of the Engineer at no additional cost to Owner.
- B. Subgrade preparation:
 - 1. Immediately prior to applying prime coat or tack coat, or immediately prior to placing the asphalt pavement when prime coat or tack coat is not required, the subgrade to receive asphalt pavement shall conform to the compaction

requirement and elevation tolerances specified for the material involved and shall be cleaned to remove any loose or extraneous material.

2. If the asphalt pavement is to be placed on an existing base or pavement that was not constructed as part of the contract, the Contractor shall clean the surface by sweeping, flushing, or other means to remove loose particles of paving, dirt, and other extraneous material immediately before applying the prime coat or tack coat.

3.03 PRIME COAT AND TACK COAT

A. Prime coat:

1. A prime coat of liquid asphalt shall be applied on surfaces of base course material to be paved.
2. Prime coat shall be applied at a rate of 0.25 gallons per square yard and shall conform to Section 93-1.03 of the Caltrans Standard Specifications for the distributor application of the grade of liquid asphalt being used.

B. Tack coat:

1. A tack coat of asphaltic emulsion shall be applied to vertical surfaces of existing pavement, curbs, gutters, and construction joints in the surfacing against which additional material is to be placed, or as otherwise specified in this Section.
2. Tack coat shall be applied in one application at a rate of 0.1 gallons per square yard of surface covered.

3.04 ASPHALT PAVEMENT

- A. Placing materials in a windrow, then picking it up and placing it in the asphalt paver with loading equipment, will be permitted provided that:
 1. The asphalt paver is of such design that the material will fall into a hopper that has a movable bottom conveyor to feed and screed.
 2. The loader is constructed and operated so that substantially of the material deposited into windrows is picked up and deposited into the paving machine.
 3. The windrow is deposited only so far in advance of the paver to provide for continuous operation of the paver and not so far as to allow the temperature of the asphalt pavement in the windrow to fall below 260 degrees Fahrenheit.
- B. Unless lower temperatures are directed by the Engineer, asphalt concrete shall be spread, and the first coverage of initial or breakdown compaction shall be performed when the temperature of the mixture is not less than 250 degrees Fahrenheit, and breakdown compaction shall be completed before the temperature of the mixture drops below 205 degrees Fahrenheit.
- C. Open graded asphalt concrete shall be spread at a temperature of not less than 205 degrees Fahrenheit, and not more than 250 degrees Fahrenheit, measured in the hopper of the paving machine. Open graded asphalt concrete shall be compacted as soon as possible after spreading.
- D. Asphalt pavement shall be spread and compacted in the number of layers and of the thicknesses indicated in the following table:
 1. A thickness tolerance of within 0.1 inches is allowed for asphalt concrete.
 2. A total thickness tolerance of within 0.2 inches is allowed for asphalt concrete base.

Total Thickness Indicated on Drawings ⁽¹⁾	Number of Lifts	Top Layer Thickness (inches)		Next Lower Layer Thickness (inches)		All Other Lower Layer Thicknesses (inches)	
		Min.	Max.	Min.	Max.	Min.	Max.
<2-3/4 inches	1	-----	-----	-----	-----	-----	-----
3 inches ⁽²⁾	2	1-1/4	1-1/2	1-1/4	1-1/2	-----	-----
3-1/4 - 4-3/4 inches	2	1-3/4	2-1/4	1-3/4	3	-----	-----
>5 inches	(3)	1-3/4	2-1/4	1-3/4	3	1-3/4	4-3/4

Notes:

- (1) ~~When pavement reinforcing fabric is shown to be placed between layers of asphalt pavement, the thickness of asphalt pavement above the pavement reinforcing fabric shall be considered to be the "Total Thickness Indicated on the Drawings" for the purpose of spreading and compacting the asphalt pavement above the pavement reinforcing fabric.~~ Not Applicable. ^{AD3}
- (2) If approved by the Engineer, one lift of 3 inches may be placed.
- (3) At least 2 layers shall be placed if the total thickness is less than 5 inches. At least 3 layers shall be placed if the total thickness is more than 5 inches, and less than 10-1/2 inches. At least 4 layers shall be placed if the total thickness is greater than 10-1/2 inches.

- E. A layer shall not be placed over another layer which exceeds 3 inches in compacted thickness until the temperature of the layer which exceeds 3 inches in compacted thickness is less than 160 degrees Fahrenheit at mid depth:
1. If the temperature of any layer drops below 140 degrees Fahrenheit, or if directed by the Engineer, apply tack coat before placing next layer.
- F. Unless otherwise indicated on the Drawings, asphalt mixtures shall not be handled, spread, or windrowed in a manner that will stain the finished surface of any pavement or other improvements.
- G. The completed mixture shall be deposited on the prepared subgrade at a uniform quantity per linear foot, as necessary to provide the required compacted thickness without resorting to spotting, picking up, or otherwise shifting the mixture.
- H. Spreading:
1. All layers of asphalt pavement shall be spread with an asphalt paver and shall conform to Section 39-1.11 and applicable referenced sections of the Caltrans Standard Specifications.
 2. At locations where the asphalt pavement is to be placed over areas inaccessible to spreading and rolling equipment, layers of asphalt pavement shall be distributed directly out of the back of the dump truck and spread by hand:
 - a. Asphalt pavement spread by hand shall be compacted thoroughly to the required lines, grades, and cross-sections by means of pneumatic tampers, or by other methods that will produce the same degree of compaction as pneumatic tampers.

- I. Compaction:
 - 1. Compaction of asphalt pavement shall conform to Sections 39-1.11, 39-3.03, 39-3.04, and applicable referenced sections of the Caltrans Standard Specifications.
 - 2. Minimum required density for each layer of asphalt pavement shall be 95 percent of that obtained in the laboratory in accordance with ASTM Test Method D1561.
- J. Segregation shall be avoided, and the surfacing shall be free of pockets of coarse or fine material. Asphalt pavement containing hardened lumps shall not be used:
 - 1. In areas inaccessible to paving and compacting equipment where spreading is done by hand, minimize the amount of segregation.
- K. Location of longitudinal joints in the top layer will be determined by the Engineer and shall not adversely affect the quality of the finished product.
- L. At locations, or as directed by the Engineer, the asphalt concrete shall be square and at least 1-inch thick when conforming to existing surfacing. Tapering or feathering is not allowed.

3.05 FIELD QUALITY CONTROL

- A. Contractor shall control the quality of Work to ensure compliance with these Specifications:
 - 1. The type and size of the samples shall be suitable to determine conformance with stability, density, thickness, and other specified requirements. Use an approved power saw or core drill for cutting samples. Furnish tools, labor, and materials for cutting samples, testing, and replacing the pavement where samples were removed. Take a minimum of 1 sample for every 4,000 square feet of asphalt pavement placed.
- B. All asphalt pavement shall match the grades indicated on the Drawings and shall be completely free from unintended hollows and high spots:
 - 1. After completion of paving work, paving shall be flooded with water by the Contractor. Any ponding that results in standing water greater than 3/4 inch in depth shall be ringed with chalk. Such hollows shall be corrected by removing and replacing the asphalt concrete. The asphalt concrete patch shall be square and at least 1-inch thick when conforming to existing surfacing. Tapering or feathering is not allowed.
- C. Construction Manager shall perform in-place density and compaction tests of the completed pavement in accordance with California Test Method Number 375, to determine compliance with the specified requirements. Submit test results to Engineer for approval.
- D. Cracks, settling of surface, improper drainage, improper compaction, and sloppy connection to previously laid surfaces will be construed as improper workmanship and will not be accepted.

3.06 MAINTENANCE OF PAVEMENT

- A. Upon completion of final rolling, traffic shall not be permitted on the finished pavement for at least 6 hours, or until the asphalt pavement has cooled sufficiently to withstand traffic without being deformed.

3.07 WORKMANSHIP AND WARRANTY

- A. Contractor shall provide written warranty against defects in materials or workmanship for a period of not less than 1 year upon completion of Work.

END OF SECTION

^{AD3} Addendum No. 3

SECTION 02810
PLANTING IRRIGATION

PART 1 GENERAL

1.01 SUMMARY DESCRIPTION

- A. Scope of Work:
 - 1. Provide irrigation systems as shown on the Drawings and described herein.
- B. Related Work:
 - 1. Division 16 - Electrical: Power connection for controller.

1.02 SUBMITTALS

- A. Material List:
 - 1. Complete manufacturer's technical data and installation instructions shall be submitted prior to performing any work. Material list shall include the manufacturer, model number and description of all materials and equipment to be used.
- B. Record Drawings:
 - 1. The original record drawings shall be submitted to the Owner's Representative for approval prior to making the controller chart. Refer to Section 01770 - Closeout Procedures.
 - 2. Drawings shall include dimensions from two permanent points of reference such as building corners, sidewalks, or road intersections for the location of the following items:
 - a. Connection to existing water lines.
 - b. Connection to existing electrical power and splice locations.
 - c. Relocated existing equipment.
 - d. Gate valves.
 - e. Routing of sprinkler pressure lines.
 - f. Sprinkler locations.
 - g. Sprinkler control valves.
 - h. Routing of control wiring.
 - i. Quick coupling valves.
 - j. Other related equipment as directed by the Owner's Representative.
- C. Controller Charts:
 - 1. Controller charts shall be prepared by Contractor.
 - 2. Provide one controller chart for each controller supplied.
 - 3. The chart shall show the area controlled by the automatic controller and shall be the maximum size which the controller door will allow when rolled up.
 - 4. The chart shall be a reduced drawing of the actual as-built system and shall be readable when reduced.
 - 5. The chart shall be a black line print and different colors shall be used to indicate the area of coverage for each station.

6. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 10 mils if required by Owner's Representative.
 7. As-built record drawings and controller charts shall be completed and approved prior to final inspection of the irrigation system.
- D. Operation and Maintenance Manuals:
1. Contractor shall prepare Operation and Maintenance Manuals in accordance with Section 01782 - Operations and Maintenance Manuals.
 - a. Index sheet stating Contractor's address and telephone number, list of equipment with name and addresses of local manufacturer's representative.
 - b. Catalog and parts sheets on all major material and equipment items installed under this contract (not necessary for site standard irrigation equipment).
 - c. Guarantee statement.
 - d. Complete operating and maintenance instructions on all major equipment.
- E. Equipment to be Furnished:
1. Furnish the following tools:
 - a. Two sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve provided on this project.
 - b. Two keys for each automatic controller.
 - c. Two quick coupler keys and matching hose swivel per project.
 2. This equipment shall be furnished to Owner before final inspection can occur. Evidence that the Owner has received material must be provided to Owner's Representative.

1.03 QUALITY ASSURANCE

- A. Manufacturer's directions and detailed drawings shall be followed in all cases where points are not shown in the Drawings and Specifications.
- B. Drawings are generally diagrammatic and indicative of the work to be installed and do not show all offsets, fittings, sleeves, and other parts which may be required. Contractor shall carefully investigate the structural and finished conditions affecting all work and plan accordingly, furnishing such fittings, and other appurtenances as may be required to meet such conditions. The Work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, and architectural features.
- C. Before commencing irrigation system installation, Contractor shall resolve obstructions, grade differences or discrepancies in area dimensions that might not have been considered in engineering and shown on the Drawings.

1.04 COORDINATION AND SCHEDULING

- A. Contractor shall notify Owner's Representative in advance for the following observation meetings, according to the time indicated, and shall provide documentation to Owner's Representative that the following meetings occurred and their outcome.
1. Sleeve inspection - 48 hours.
 2. Pressure supply line installation and testing - 48 hours.

3. Automatic controller installation - 48 hours.
4. Control wire installation - 48 hours.
5. Lateral line and sprinkler installation - 48 hours.
6. Flushing of lines - 48 hours.
7. Coverage test (prior to any planting installation) - 48 hours.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

- A. PVC Pressure Main Line Pipe and Fittings:
 1. Pressure main line piping for sizes 4 inches and larger shall be C-900 with mechanical joints.
 2. Pressure main line piping smaller than 4 inches inside sleeves, shall be PVC Schedule 40.
 3. Pressure main line piping for sizes 3 inches and smaller shall be PVC Schedule 40 with solvent welded joints and with Schedule 80 fittings.
 4. Pipe shall be made from NSF approved Type I, Grade I PVC compound conforming to ASTM resin specification D1785. All pipe shall meet requirements as set forth in Federal Specification PS-21-70.
 5. PVC solvent-weld fittings shall be Schedule 40, 1-2, II-I NSF approved conforming to ASTM test procedure D2466.
 6. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be Christy's Red Hot Blue Glue, or equal.
 7. All PVC pipe must bear the following markings and shall be visible upon installation.
 - a. Manufacturer's name.
 - b. Nominal pipe size.
 - c. Schedule or class.
 - d. Pressure rating in PSI.
 - e. NSF (National Sanitation Foundation) approval.
 - f. Date of extrusion.
 8. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable Iron Pipe Size (IPS) schedule and NSF seal of approval.
- B. PVC Non-Pressure Lateral Line Piping:
 1. Non-pressure buried lateral line piping shall be PVC schedule 40 with solvent-welded joints.
 2. Pipe shall be made from NSF approved, Type I, Grade II PVC compound conforming to ASTM resin specification D1784. All pipe shall meet requirements set forth in Federal Specification PS-22-70 with an appropriate standard dimension ratio.
 3. Except as noted above, all requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent-weld pressure main line pipe and fittings as set forth in these specifications.
 4. For all sprinkler head installations use schedule 80 thread nipples and risers, and schedule 40 fittings.

- C. PVC Sleeves:
 - 1. PVC sleeves shall be Schedule 40 with solvent weld joints. Install sleeves at 24 inches depth for streets, 18-inch depth for sidewalks, to top of pipe. Backfill sleeve trench with sand. Depth exception may be considered at concrete walks with prior approval by Owner's Representative.
- D. Brass Pipe and Fittings:
 - 1. Where indicated on the Drawings, use red brass threaded pipe.
 - 2. Fittings shall be red brass conforming to Federal Specification #WW-P-460.

2.02 VALVES

- A. Gate Valves:
 - 1. Gate valves 3 inches and larger shall be 125 pounds Static Water Pressure (SWP) bronze gate valve with screw-in bonnet, non-rising stem, solid wedge disc, threaded ends and a bronze or malleable iron handwheel. With a 2-inch operating nut.
 - 2. Gate valves 2-1/2 inches and smaller shall be brass, manufactured by Nibco, Aqua, Matco, or equal, 200 psi Water Oil Gas (WOG), 125 SWP, Screw-in bonnet, solid wedge.
- B. Quick Coupling Valves:
 - 1. Quick coupling valves shall have a brass two-piece body designed for working pressure of 125 PSI operable with quick coupler.
 - 2. Key size and type shall be as shown on Drawings.
 - 3. Quick coupling valves shall be manufactured by Hunter (HQ44 – AW), Rainbird (44-LRC), Buckner (QB44) or equal.
 - 4. All quick coupling valves without integral stabilizers shall be equipped with cast ductile iron anti-rotation devices or anchors that attached to the base of the valve and can be secured by a single bolt, and shall be manufactured by Leemco (LS-120, LS-150), Harco (82201, 82202) or equal .
- C. Electrical Remote Control Valves:
 - 1. Electric control valves shall have a manual flow adjustment.
 - 2. Provide one control valve box for each electric control valve.
 - 3. Electric Remote Control Valves shall be manufactured by Hunter (ICV Series), Irritrol (Century Series), or equal.
 - 4. Pressure regulating modules as required for pressure reduction on new or existing valves manufactured by, Hunter (Accu-Sync), Irritrol (Omni Reg), or equal, as noted on Drawings.
 - 5. For pipe connections to valve bodies use Teflon tape material. Pipe dope shall not be used.
- D. Associated Equipment:
 - 1. Wye-Strainer at POC shall be brass 80 mesh with brass gate valve to blow-out screen.
 - 2. Above ground Wye-strainers shall be metal.
 - 3. Wye-strainer shall be same size as water supply.
 - 4. Gate valves 3 inches and smaller shall be brass.

- E. Wye-Filters:
 - 1. Wye filter with stainless steel screen, minimum 120 mesh, size to match valve. Rain Bird LCRBY-S, Hunter HY or equal.
 - 2. All new systems with rotating stream nozzles and all existing stations being converted from a standard spray or rotor system to a system with rotating stream nozzles (MP rotator or equal) shall include and/or be retrofitted with a Wye-filter as noted above.

2.03 BACKFLOW PREVENTION UNITS

- A. Backflow prevention units shall be of size and type indicated on the Irrigation Drawings. Install backflow prevention units in accordance with irrigation details.

2.04 WIRING

- A. Irrigation Control Wiring: Copper direct burial sprinkler wire, sized according to length of the run, minimum 14 gauge (white common, red primary lead, blue for spares). Run extra wires for future valves at the ends of all main line runs (see Drawings – 4 wires minimum).
- B. Electrical Dry Connection. Spears DS -400, pre-filled dri-splice connector with crimp sleeves; DRYCONN #10222 waterproof connectors by King Innovations (#22 to #12AWG), or equal. Waterproof under-ground wire connections.
- C. Communication Cable: All communication wire for controllers and sensors shall be installed in electrical conduit not less than 1 inch.

2.05 AUTOMATIC CONTROLLERS

- A. See landscape irrigation sheet.

2.06 MAIN LINE SHUT OFF BOX

- A. Install main line shut off valve at point of connection in a Christy concrete G5 traffic box for Main Line Shut Off Valves with “water” labeled lid, or equal.

2.07 CONTROL VALVE BOXES

- A. Use 10 by 10-1/4 inch round box for all gate valves, Carson Industries #910-12B with green bolt down cover, or equal. Extension sleeve shall be PVC - 6 inch minimum size. Traffic-rated box ~~if installed in roadway unless otherwise indicated on the Drawings~~^{AD3}.
- B. Use 9 1/2 by 16 by 11 inch rectangular box for all electrical control valves, Carson Industries 1419- 13B with green bolt down cover, or equal. Traffic-rated box ~~if installed in roadway unless otherwise indicated on the Drawings~~^{AD3}.

2.08 DEEP ROOT WATERING TUBES

- A. Deep Watering Tube: 3-inch or 4-inch diameter semi-rigid polyethylene mesh tube (10 inch, 18 inch, 24 inch or 36 inch) with adjustable bubbler. Construct assembly as shown in details or use Hunter RZWS or equal, size per Drawings.

2.09 REMOTE CONTROL VALVE IDENTIFICATION TAGS

- A. 2-1/4 by 2-3/4 inch yellow polyurethane with valve number embossed on tag, as manufactured by Christy's Irrigation I.D. Tags, (714) 771-4142, or equal.

PART 3 EXECUTION

3.01 INSPECTION

- A. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by Contractor's operations or neglect. Check existing Utilities Drawings for existing utility locations.
- B. Refer to 1.04 Coordination and Scheduling for additional inspection requirements.

3.02 PREPARATION

- A. Physical Layout:
 - 1. Prior to installation, Contractor shall paint or flag out all pressure supply lines, routing and location of sprinkler heads.
 - 2. All piping and tubing layout shall be approved by Owner's Representative prior to installation.
- B. Water Supply:
 - 1. Point of Connection (POC): Install hydrometer and wye strainer /after brass gate valve. The hydrometer and wye strainer to be main line-sized or larger for project and have the capacity to have additional systems added on in the future.

3.03 INSTALLATION

- A. Trenching:
 - 1. Provide a minimum cover of 18 inches for all pressure supply lines.
 - 2. Provide a minimum cover of 12 inches for all non-pressure pvc lines.
 - 3. Provide a minimum cover of 18 inches for all control wiring.
- B. Backfilling:
 - 1. No backfilling shall occur until Owner's Representative visually inspects and approves piping layout in trenches.
 - 2. A fine granular material backfill shall be initially placed on all lines. No foreign matter larger than 1/2 inch in size will be permitted in the initial backfill. The trenches shall not be backfilled until all required tests are performed. Trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, free from 4 inch or greater clods of earth or 1/2 inch or greater stones, gravel or other debris. Backfill shall be mechanically compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill shall conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.

3. Flooding of trenches will be permitted only with approval of the Owner's Representative.
4. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments at no additional cost to the Owner.

C. Trenching and Backfill Under Paving:

1. Trenches located under areas where paving (asphaltic concrete or concrete), will be installed shall be backfilled with sand (a layer 6 inches below the pipe and 3 inches above the pipe) and compacted in layers to 95 percent compaction, using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm condition, not prone to settling. All trenches shall be left flush with the adjoining grade. The Contractor shall set in place, as part of the sprinkler Work, cap and pressure test all piping under paving prior to the paving Work.
2. Piping under existing walks shall be done by jacking, boring or hydraulic driving where possible. Where any cutting or breaking of sidewalks or concrete is necessary permission shall be obtained from the Owner's Representative. No hydraulic driving will be permitted under concrete paving. Concrete paving shall be replaced back to nearest control joint. See Section 02300 - Earthwork.
3. Provide for a minimum cover of 18 inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphalt or concrete paving.

D. Pipe Assemblies:

1. PVC pipe, drip tube, and fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation and solvent welding methods shall be as recommended by the pipe and fitting manufacturer.
2. On PVC to metal connections, Contractor shall work the metal connections first. Pipe tape shall be used on all threaded PVC to PVC, and on all threaded PVC to metal joints. Light wrench pressure is all that is required. Where threaded PVC connections are required, use threaded PVC adapters or machined PVC schedule 80 pipe nipples into which the pipe may be welded.
3. Do not install multiple assemblies in plastic sleeves.
4. Use fittings to change pipe directions. Do not deflect pipe beyond manufacturer's recommendations.
5. Do not install joints in sleeves or under pavement if length is less than 20 feet. Where pipe length exceeds 20 feet, use minimum number of joints.
6. Install PVC piping and fittings without tension on the fittings. Pipes should be inserted squarely and fully into socket of the fittings.

E. Pipe Clearance: All pipes shall have a minimum clearance of 6 inches from each other and from lines of other Work. Parallel pipes shall not be installed directly over one another. No more than two pipes may be installed in a single trench.

F. High Voltage Wiring for Automatic Controller:

1. Provide 120 volt power connection to the automatic controller.
2. Electrical connections for automatic controller shall be made to electrical points of connection.
3. Electrical connection shall be on separate circuit breaker.

- G. Remote Control Valves:
1. Install where shown on Drawings and details. When grouped together, allow at least 12 inches between valve box edges. Install each remote control valve in a separate valve box.
 2. Each controller and station number shall be labeled at the valve with a 2-1/4 by 2-3/4 inch yellow polyurethane I.D. tag attached to the control wire of the valve.
 3. Set valve boxes perpendicular to adjacent walls and parallel to one another.
 4. Thoroughly flush mainline before installing valves.
 5. Install valve and box to maintain a minimum of 1 inch clear space between the top of the valve and the lid of the box.
 6. Install valve box at the same level as soil grade, not above.
- H. Control Wiring:
1. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.
 2. Where more than 1 wire is placed in a trench, the wiring shall be taped together at intervals of 10 feet.
 3. An expansion curl shall be provided within 3 feet of each wire connection. Expansion curl at electric control valves shall be of sufficient length so that in case of repair, the valve bonnet may be brought to the surface without disconnecting the control wires. Control wires shall be laid loosely in trench without stress or stretching of control wire conductors.
 4. All splices shall be made with electric dry connections. Use one splice per connector.
 5. Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of Owner's Representative.
- I. Flushing of System:
1. After all new sprinkler pipe lines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and a full head of water used to flush out the system.
 2. Sprinkler heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Owner's Representative.
 3. Flush drip systems before installation of flush and air relief valves, keep ends open.
 4. Contractor shall flush all existing and new sprinkler heads on existing stations that have been turned off or altered.

3.04 EXISTING TREES

- A. Where it is necessary to excavate adjacent to existing trees, the Contractor shall first discuss with the Owner Representative and get written permission for proposed trench route. Contractor shall use all possible care to avoid injury to trees and tree roots. Refer to Section 01562 – Temporary Tree and Plant Protection.

3.05 FIELD QUALITY CONTROL

- A. Testing of Irrigation System:
 - 1. Contractor shall request the presence of the Owner's Representative in writing at least 48 hours in advance of testing. Testing of pressure mainlines shall occur prior to installation of electric control valves.
 - 2. Test all pressure lines under hydrostatic pressure of 150 pounds per square inch, and prove watertight.
 - 3. Sustain pressure in lines for not less than 2 hours. If leaks develop, replace joints and repeat test until entire system is proven watertight.
 - 4. All hydrostatic tests shall be made in the presence of Owner's Representative. No pipe shall be backfilled until it has been inspected, tested and approved in writing, including laterals.
 - 5. Furnish necessary force pump and all other test equipment.
 - 6. When the sprinkler or drip irrigation system is completed, perform a coverage test in the presence of the Owner's Representative, to determine if the water coverage for planting areas is complete and adequate. This test shall be accomplished before any plants are planted. This requirement applies to both temporary and permanent irrigation system installations.
- B. Adjustment of the System:
 - 1. Contractor shall adjust all existing and new sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible. This includes sprinkler heads on existing systems that have been turned off or altered.
 - 2. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required.
 - 3. All sprinkler heads shall be set perpendicular to finished grades unless otherwise shown on the Drawings.
 - 4. Individual stations shall be completely installed and operable by controller for a period of 2 days prior to any planting. The Owner's Representative reserves the right to waive or shorten the operation period.

3.06 CLEAN-UP

- A. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed or washed down.

3.07 FINAL OBSERVATION PRIOR TO ACCEPTANCE

- A. Contractor shall operate each system in its entirety for the Owner's Representative at time of final observation. All items must meet Specifications in order to be approved and accepted.
 - 1. Final Observation shall occur between substantial completion and final completion.
- B. The controller must be set up and under full automatic operation before final inspection can occur and maintenance period can begin.
- C. Controller charts and final as-built record drawings shall be submitted in both electronic form and as 1 full-size hard copy. Both must be provided to the Owner's

Representative and approved before final inspection can occur and maintenance period can begin. Refer to 1.2. B. and C.

- D. Contractor shall show evidence to the Owner's Representative that the Owner has received all accessories, charts, record drawings, and equipment as required before final inspection can occur.

END OF SECTION

^{AD3} Addendum No. 3

SECTION 02820
FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Fence, framework, fabric, and accessories.
 - 2. Excavation for post bases and concrete foundation for posts.
 - 3. Manual gates and related hardware.
 - 4. Gate operators.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. A121 - Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
 - 2. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 4. A385 - Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
 - 5. A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
 - 6. A702 - Standard Specification for Steel Fence Posts and Assemblies, Hot-Wrought.
 - 7. F626 - Standard Specification for Fence Fittings.
 - 8. F668 - Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric.
 - 9. F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework.
 - 10. F1184 - Standard Specification for Industrial and Commercial Horizontal Slide Gates.
 - 11. F2200 - Standard Specification for Automated Vehicular Gate Construction.
- B. Underwriters Laboratories, Inc. (UL):
 - 1. 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.03 SUBMITTALS

- A. Product data: Submit data completely describing products.
- B. Shop drawings:
 - 1. Remote and automatic gates: Submit drawings showing connection details indicating methods and means of mounting, attaching, and installing operators and locks to gates, including wiring diagrams.

~~C. Samples: Provide for polyvinyl chloride-coated fabric and accessories.~~^{AD3}

~~D.C.~~ E.D. Quality control submittals:

1. Certificates of compliance: Provide certification that materials conform to referenced specifications.
2. Qualifications: Provide installer's references and list of local references.
3. Manufacturer's instructions: Provide for gate operator equipment.

~~E.D.~~ Contract closeout submittals:

1. Operation and maintenance manuals: Provide for electrical and mechanical equipment.

1.04 QUALITY ASSURANCE

- A. Pre-installation conference: Participate in conference, if required.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Storage and handling: Unload, store, and protect materials such that they are not damaged.

1.06 PROJECT CONDITIONS

- A. Field measurements:
1. Verify actual field distances so that post spacing can be made uniform.
 2. Verify and coordinate gate opening and column distances for driveway.

1.07 SEQUENCING AND SCHEDULING

- A. Fences and gates: May be constructed at any time after earthwork, pipe work, and structures to which fence is related has been completed, but prior to erosion control application.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Chain link security fence and gates: One of the following or equal:
1. Allied Tube and Conduit.
 2. Master-Halco.
- B. High-security ornamental steel fence, slide gate, and personnel gates: The following or equal:
1. Ameristar Aegis II, Invincible.

2.02 DESIGN AND PERFORMANCE CRITERIA

- A. Performance requirements:
1. Gate operator controls:
 - a. In addition to standard controls furnished with gate operators, make provisions for and provide terminal connection points for controls

indicated on the Drawings and clearly indicated such connection points on operator control terminal board.

- b. Operational sequence: Provide sequence as specified in Section 17100 - Control Strategies and 17101 - Specific Control Strategies.

2.03 MATERIALS

A. Chain link fence:

1. Fabric:
 - a. Height: 7 feet 0 inch.
 - b. Mesh: 2 inches.
 - c. Size wire: 9 gauge:
 - 1) Coating: Zinc coating, ASTM A392, Class 1.
 - 2) Tensile strength: 80,000 pounds per square inch minimum.
2. Framework: In accordance with ASTM F1043 Group 1A. Pipe shall be straight and conform to the following weights:

Pipe Size Outside Diameter (Inches)	Group 1A Weight (Lbs/ft)
1-5/8	2.27
1-7/8	2.72
2-3/8	3.65
2-7/8	5.79
3-1/2	7.58
4	9.11
6-5/8	18.97
8-5/8	24.70

- a. Top rail:
 - 1) Size: 1-5/8 inches outside diameter.
 - 2) Tension wire: 7-gauge galvanized coil spring wire.
- ~~b. Bottom rail:~~
 - ~~1) Size: 1-5/8 inches outside diameter.~~
 - ~~2) Tension wire: 7-gauge galvanized coil spring wire.~~^{AD3}
- ~~c. b.~~ Line posts:
 - 1) Size: 2-3/8-inch outside diameter.
- ~~d. c.~~ Terminal, corner, and pull posts:
 - 1) Size: 2-7/8-inch outside diameter.
- ~~e. d.~~ Coatings:
 - 1) Group 1A: External coatings in accordance with ASTM F1043 Type A; internal coatings in accordance with ASTM F1043 Type A.
3. Accessories:
 - a. Fence fittings: In accordance with ASTM F626:
 - 1) Post top fittings:
 - a) Provide post caps that fit snugly over posts to exclude moisture. Provide dome style caps for terminal posts and loop style caps for line posts.
 - b) Extension arms, 45-degree angle type, capable of receiving 3 strands of barbed wire.

- 2) Rail and brace ends: Provide pressed steel or malleable castings that are cup shaped to receive rail and brace ends.
- b. Fabric accessories:
 - 1) Wire clips: Minimum 6 gauge hot-dip galvanized.
 - 2) Tension bars: 1/4 inch by 3/4 inch, galvanized.
 - 3) Steel bands: 11 gauge, 1 inch wide, hot-dip galvanized.
 - 4) Bolts and nuts: 3/8-inch diameter.
 - 5) Hog rings: 11 gauge.
4. Barbed wire:
 - a. Total number strands: 3.
 - b. Line posts: In accordance with ASTM A702, Class B, "T-Section", 7 feet long and weighing not less than 9.3 pounds including anchor plate.
 - c. Gate and corner posts: Unpunched angle posts, 2-1/2 inches by 2-1/2 inches by 1/4 inch with 2 inches by 2 inches by 1/4 inch angle braces.
 - d. Barbed wire strands:
 - 1) Not less than 12-1/2 gauge galvanized wires with 14 gauge, 4 point galvanized barbs (at not more than 5 inches on center spacing).
 - 2) Wires per strand: 2.
 - e. Coatings:
 - 1) Galvanize: In accordance with ASTM A121, Class 2.
 - 2) ~~PVC: In accordance with ASTM F668, color selected by Engineer.~~^{AD3}
 - f. Stays: Minimum 9-1/2 gauge galvanized twisted wire.

B. Chain link and barbed wire gates:

1. Personnel gates and double-leaf swing gates shall include barbed wire.
2. Gate posts and concrete foundations for gate posts: Except where differently indicated on the Drawings, determine gate posts and concrete foundations for gate posts in accordance with following schedule:

Gate Leaf Widths (Feet)	Gate Posts	Foundations	
	Post O.D. ASTM F1043 Group IA or IC (Inches)	Diameter (Inches)	Depth (Feet)
0 TO 6	2-7/8	12	4
Over 6 to 13	4	18	4
Over 13 to 18	6-5/8 (Group IA)	18	4
Over 18 to 25	8-5/8 (Group IA)	18	4.5

3. Chain link gates:
 - a. Frames and center supports: 1-7/8-inch outside diameter galvanized steel pipe that in accordance with ASTM F1043 Group IA.
 - b. Gate accessories:
 - 1) Post top fittings:
 - a) Provide post caps that fit snugly over posts to exclude moisture.
 - b) Provide dome style caps for terminal posts and loop style caps for line posts.
 - c) Post top fittings: Extension arms, 45-degree angle type, capable of receiving three strands of barbed wire.
 - 2) Corner fittings: Heavy pressed steel or malleable castings.

- 3) Gate tensioning:
 - a) Cross tensioning rods: 3/8 inch, galvanized.
 - b) Turnbuckles: Heavy duty.
- 4) Tension rods for 4-foot gates: 3/8 inch, easily adjustable, galvanized.
- 5) Gate frame corner fittings: Fitting designed for purpose, Manufacturer's standard.
- 6) Horizontal gate stiffeners: 1-5/8-inch outside diameter galvanized steel pipe that in accordance with ASTM F1043 Group IA or IC.
- 7) Gate hardware:
 - a) Catch and locking attachment: Combination steel or malleable iron catch and locking attachment of acceptable design.
 - b) Stops:
 - (1) Type 1: Capable of holding gates open.
 - (2) Type 2: Center rest with catch.
 - c) Color: Match color of fabric.

C. Barbed wire gates:

1. Frame: 1-3/8-inch outside diameter tubular steel, galvanized.
2. Center support: 7/8 inch outside diameter tubular steel, galvanized.
3. Filler wire: 11 gauge.
4. Wire clamps: Wire T-clamps, galvanized.
5. Hardware: Suitable hinges and latches.
6. Padlocks: 1-1/2-inch minimum galvanized. Key padlocks alike.
7. Chain:
 - a. Links: Hardened steel, minimum 1-3/8 inches long, minimum 3/16-inch diameter links.
 - b. Length: Sufficient to padlock 2 gates together.

D. High-security ornamental steel fence and gates:

1. Minimum dimensions:
 - a. Pickets: 1-inch square, min. 14 gauge.
 - b. Rails: 1-3/4-inch square, min. 14 gauge.
 - c. Posts: 2.5-inch square, min. 12 gauge.
2. Height: As indicated on the Drawings.

2.04 MANUFACTURED UNITS

A. Special gates:

1. Slide gates:
 - a. Consist of a single movable section.
 - b. Materials of construction shall match the high-security ornamental steel fence.
 - c. Provide with front roller wheels and 2 sets of rear rollers on channel tracks.
 - d. Shop welded by arc-gas shield method.
 - e. Provide welds that are smooth and clean. No weld residue will be allowed.
 - f. Provide controls for slide gate motor operator such that operator can be controlled by either of 2 manually operated switches ~~located where~~

~~indicated on the Drawings. Field verify locations of manually operated switches with Construction Manager~~^{AD2}:

- 1) Also provide control for motor operator such that gate can be controlled by either of 2 key-operated switch stations.
 - a) ~~Approximate location of 1 key-operated switch station shown on drawings for reference. Coordinate final location of switch stations with Construction Manager.~~^{AD2}
 - 2) Provide gooseneck-mounting stands for switch station and key such stations alike.
- g. Provide 1 key-operated switch station located inside gate.
- B. Outside gate operator stand for entry.

2.05 EQUIPMENT

A. Slide gates:

1. Gate operator equipment:

- a. Manufacturers: One of the following or equal:
 - 1) HySecurity, SlideDriver 40 ~~with Smart Touch Controller~~^{AD2}.
 - ~~2) Richards Wilcox, Number 1295.~~
 - ~~3) Stanley Vemco, ASJH 1.~~^{AD2}
- b. Switch:
 - 1) Provide 2 key-operated switch station.
 - 2) Coordinate final location with Owner.
- c. Provide gooseneck-mounting stands for switch station and key such stations alike.
- d. Provide each sliding type electric operator unit built into compact enclosure mounted on heavy steel base.
 - 1) Provide weatherproof and pad lockable enclosure.
- e. Electric operator unit:
 - 1) In accordance with UL 325.
 - ~~2) Provide unit consisting of right angle gear head instantly reversing motor and magnetic brake, safety disc clutch, chain driven geared type automatic limit switch, magnetic reversing starter with overload protection, open and close adjustable limit switches, and emergency release for operation during power failure.~~
 - ~~2) Type: Hydraulic geroller.~~^{AD2}
 - 3) Provide unit that is prewired and ready to be connected to power and control sources.
 - 4) Provide operators capable of operating on nominal 480-volt, 3 phase, 60 hertz power supply.
 - 5) Size motor to be capable of moving the weight of the gate.
- ~~f. Gear head motor:~~
 - ~~1) Provide motor that is built as 1 unit with 1 stage of reduction.~~
 - ~~2) Provide reduction stage consisting of carefully machine cut carburized worm and SAE 65 bronze worm gear.~~
 - ~~3) Bearings: Provide anti-friction bearings complying with following:~~
 - ~~a) On motor shaft: Highest quality ball bearings.~~
 - ~~b) On slow speed shafts: Tapered roller bearings.~~
 - ~~4) Gears and bearings: Operate in bath of oil:~~
 - ~~a) Prevent leakage of oil by providing double type oil seals around motor shaft and countershaft.~~

- b) ~~Provide magnetic drum type brake with its easily adjustable feature built onto jackshaft for positive gate control.~~
- g. ~~Automatic limit switch:~~
- 1) ~~Provide automatic limit switch designed to stop gates in fully open or closed positions that is precision built gear type driven by chain drive from jackshaft of operator.~~
 - 2) ~~Provide limit switch chain drive so located that any safety friction disc clutch slippage or manual operation of gate shall not cause mistiming of operator mechanism.~~
- f. Mechanical components:
- 1) Supporting arms: Cast aluminum channel. Arms shall incorporate a fully bushed, 1 1/2-inch (38 mm) bronze bearing surface, acting on arm pivot pins.
 - 2) Arm pivot pins: 3/4-inch (19 mm) diameter, stainless steel, with integral tabs for ease of removal.
 - 3) Tension spring: 2 1/2-inch (63 mm) heavy duty, 800 lb (363 kg) capacity.
 - 4) Tension adjustment: Finger tightened nut, not requiring the use of tools.
 - 5) Drive release: Must instantly release tension on both drive wheels, and disengage them from contact with drive rail in a single motion, for manual operation.
 - 6) Limit switches: Fully adjustable, toggle types, with plug connection to control panel.
 - 7) Chassis: 1/4-inch (6 mm) steel base plate, and 12 Ga. (3 mm) sides and back welded and ground smooth.
 - 8) Cover: 16 Ga. (1 mm) zinc plated steel with textured TGIC polyester powder coat finish. All joints welded, filled and ground smooth. Finished corners square and true with no visible joints.
 - 9) Finish: Zinc plated steel with textured TGIC polyester powder coat finish, proven to withstand 1,000 hour salt spray test.
 - 10) Drive wheels: Two 6-inch diam (152 mm) AdvanceDrive wheels. High-strength composite hub with polyurethane over mold.
 - 11) Drive rail: Shall be extruded 6061 T6, not less than 1/8-inch (3 mm) thick. Drive rail shall incorporate alignment pins for ease of replacement or splicing. Pins shall enable a perfect butt splice.
 - 12) Hydraulic hose: Shall be 1/4-inch (6 mm) synthetic, rated to 3,000 psi (20.6 MPa).
 - 13) Hydraulic valves: Shall be individually replaceable cartridge type, in an integrated hydraulic manifold.
 - 14) Hose fittings: At manifold shall be quick-disconnect type, others shall be swivel type.
 - 15) Hydraulic fluid: High performance type with a viscosity index greater than 375 and temperature range -40 degrees Fahrenheit to 158 degrees Fahrenheit (-40 degrees Celsius to 70 degrees Celsius).
 - 16) A zero to 2,000 psi (13.7 MPa) pressure gauge, mounted on the manifold for diagnostics, shall be a standard component.
 - 17) The hydraulic fluid reservoir shall be formed from a single piece of metal, non-welded, and shall be powder painted on the inside and the outside, to prevent fluid contamination.

g. Electrical components:

- 1) Pump motor: 1 hp, 3450 RPM, 56C, TEFC. Standard voltages available in single or three phase.
- 2) All components shall have overload protection.
- 3) Electrical enclosure: Type 1, metal, with hinged lid gasketed for protection from intrusion of foreign objects.
- 4) Controls: Smart Touch Controller Board containing:
 - a) Inherent entrapment sensor.
 - b) Built in audible "warn before operate" system.
 - c) Built in timer to close.
 - d) 32 character OLED display for reporting of functions and codes.
 - e) Multiple programmable output relay options.
 - f) Anti-tailgate mode.
 - g) Built-in power surge/lightning strike protection.
 - h) Menu configuration, event logging and system diagnostics easily accessible with a PC and HySecurity's free Smart Touch Analyze and Retrieve Tool.
 - i) RS-232 port for connection to laptop or other computer peripheral and RS-485 connection for network interface.
 - j) Dual gate communication connection for bi-parting, sally port, or sequenced gates.
 - k) Electromechanical and solid state relays.
 - l) Radio option outputs.
 - m) 21 inputs for site specific configurations.
- 5) Transformer: 75 VA, non-jumpered taps, for all common voltages.
- 6) Control circuit: 24 VDC. ^{AD2}

h. Operation:

- ~~1) Move gate by use of highest quality roller chain and heavy brackets attached to gates.~~ ^{AD2}
- ~~2)1) Provide simple releasing feature that is designed to operate in case of power failure.~~
- ~~3) Provide chain that is driven from dependable safety friction disc clutch on gear head motor's countershaft.~~ ^{AD2}
- ~~4)2) Provide safety clutch designed to protect personnel and equipment in case gate comes to contact with obstruction.~~
- ~~5)3) Operating speed:~~
 - ~~a) Provide operators having operating speed of not less than 60 feet per minute nor more than 90 feet per minute.~~
 - a) Provide operators having operating speed of not less than 1 foot per second and shall be stopped gradually to prevent shock loads to the gate and operator assembly. ^{AD2}
- ~~6)4) In addition to standard controls furnished with gate operators, make provisions for and provide terminal connection points for controls indicated on the Drawings and clearly indicated such connection points on operator control terminal board.~~
- ~~7)5) Operational sequence: Provide sequence as specified in Section 17100 - Control Strategies and 17101 - Specific Control Strategies.~~

B. Post mounted gate locks: Provide locks that:

1. Are electrically operated, post mounted type, and capable of positively locking gates to latch post.

2. Include manual key lock for disconnect in event of power failure.
3. Are designed to operate on 120 volts alternating current and that are suitable for outdoor use.
4. Manufacturers: The following or equal:
 - a. Stanley Vemco, Number 420-141 for slide gate.

2.06 FABRICATION

- A. Shop finishing:
 1. Galvanizing: For items not fabricated of galvanized materials hot-dip galvanize products after fabrication in accordance with following as applicable:
 - a. ASTM A123.
 - b. ASTM A153.
 - c. ASTM A385.
 2. Mark galvanized products with name of galvanize, applicable ASTM designation, and weight of zinc coating.
 3. Galvanize fabricated items complete, or in largest practicable sections.
 4. Provide galvanizing at rate of 2.0 ounces per square foot, minimum.
 5. Hardware:
 - a. Padlocks: Cadmium plated.
 - b. Chain: Galvanized.
- B. Finish schedule:
 1. Ferrous metal:
 - a. Typical: Clean, then hot-dip galvanize in accordance with galvanizing standards.
- C. Field finish touch-up painting:
 1. Galvanized repair paint: Apply paint having minimum dry film thickness of 2.0 to 3.5 mils.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions: Verify field conditions prior to construction.

3.02 PREPARATION

- A. Surface preparation:
 1. Before locating fence posts grade ground to permit grade of fence to remain constant over any local elevations or depressions in ground line.

3.03 INSTALLATION

- A. Chain link fences and gates:
 1. General:
 - a. Install chain link fence and gates as indicated on the Drawings and specified in this Section.
 - b. Provide fence systems that are plumb, taut, true to line and grade, and complete in details.

- c. Install fencing to generally follow finish grade of ground and provide pull posts at points where required to conform to change in grade.
 - d. Install fencing such that space between bottom of fence and finish ground line does not exceed 3 inches.
- 2. Concrete foundation for fence posts:
 - a. Set fence posts in concrete foundations, that extend at least 3 feet into ground, and space posts not over 10 feet apart.
 - b. Provide concrete foundations having minimum of 10 inches in diameter for line posts and 12 inches in diameter for corners and gates.
 - c. Provide foundations that extend minimum of 1 inch above finish grade and have tops that are shaped to slope to drain away from posts.
 - d. Trowel finish tops of footings, and slope or dome to direct water away from posts.
 - e. Set keepers, stops, sleeves, tracks, eye bolts, and other accessories into concrete as required.
 - f. Wheel rolling area for sliding gates shall be steel-trowel smooth finish concrete.
- 3. Post bracing:
 - a. End corner, pull, and gate posts: Brace with same material as top rail and trussed to line posts with 3/8-inch rods and tighteners.
 - b. Bracing end, corner, slope, and gate posts:
 - 1) Brace to midpoint of nearest line post or posts with horizontal braces used as compression members.
 - 2) Then from such line posts truss from brace back to bottom of end, corner, slope, or gate post with 3/8-inch steel truss rods with turnbuckles or other suitable tightening devices used as tension members.
- 4. Top rail:
 - a. Unless otherwise specified or indicated on the Drawings, install fencing with top rail and bottom tension wire.
- 5. Fabric:
 - a. Place fabric on outward facing side of the posts and install so that top edge projects over top rail of fence.
 - b. Stretch fabric taut and securely fasten to posts, top rail, and bottom tension wire.
 - c. Install tension wire parallel to line of fabric.
 - d. Fabric: Connect fabric to:
 - 1) Line posts with wire clips minimum every 14 inches.
 - 2) Terminal, corner, and gate posts with tension bars tied to posts minimum 14 inches on center and with steel bands and bolts and nuts.
 - 3) Tension wires with hog rings minimum 24 inches on center.
- 6. Post top fittings: Provide post tops with extension arms.
- 7. Swing gates:
 - a. Provide chain link fencing with swing gates, unless otherwise indicated on the Drawings or specified in this Section.
 - b. Provide swing chain link gates where indicated on the Drawings.

- B. Barbed wire fence and gates:
 - 1. Typical barbed wire fencing:
 - a. Construct barbed wire fence with gates where indicated on the Drawings:
 - 1) Posts:
 - a) Corner and gate posts and their braces: Set in concrete.
 - b) Line posts: Firmly drive into ground with flat faces away from the property.
 - c) Corner posts: Install at changes in direction over 5 degrees.
 - d) Pull posts: Provide at not more than 500 feet on centers.
 - 2. Barbed wire fencing Type 2:
 - a. Except as otherwise specified or indicated on the Drawings, install barbed wire fence in accordance with requirements as specified in Caltrans State Specifications, Section 80-3.02 and as indicated in Caltrans, Standard Plan A 78-B.1.
 - 3. Barbed wire gates:
 - a. Posts:
 - 1) Spacing: 10-foot centers.
 - 2) Gates sizes: As indicated on the Drawings.
 - 3) Wire:
 - a) Construct fence with barbed wire as specified.
 - b) Stretch wire taut to tension of not less than 100 pounds and securely fasten to each post with wire clamps.
 - c) String wire on opposite side of posts from enclosed area.
 - d) Stays: Spaced at 6 feet, 3 inches on center.
- C. Rolling gates:
 - 1. Provide gates that are motor operated:
 - a. Motor operator controls:
 - 1) Install manually operated switches where indicated on the Drawings.
 - 2) Install switch station stands where indicated on the Drawings.

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's field service:
 - 1. Manufacturer shall check and test powered gates and accessories before acceptance.
 - 2. Test gate operator through 10 full cycles and adjust operation without binding, scraping, or uneven motion.
 - 3. Test limit switches for proper "at rest" gate position.

3.05 ADJUSTING

- A. Adjust gate travel, stops, and operator position to meet field conditions.

3.06 CLEANING

- A. Clean up surplus dirt, concrete, and other waste material and dress grade up upon completion of the work.

3.07 PROTECTION

- A. Protect installed fences and gates against damage and, if damaged, repair prior to final acceptance.

END OF SECTION

^{AD3} Addendum No. 3

^{AD2} Addendum No. 2

SECTION 03300

CAST-IN-PLACE-CONCRETE

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PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Cast-in-place concrete.
- B. The requirements of this Section will require advance planning for preparation and testing of trial batches. Review the mix design and testing requirements carefully, and schedule preparations and testing with sufficient time to complete tests, to obtain Engineer's review of mixes and testing results, and to complete revisions and re-testing if required.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. 212.3R - Report on Chemical Admixtures for Concrete.
 - 2. 302.1R - Guide to Concrete Floor and Slab Construction.
 - 3. 305R - Guide to Hot Weather Concreting.
 - 4. 306R - Guide to Cold Weather Concreting.
 - 5. 318 - Building Code Requirements for Structural Concrete and Commentary.
 - 6. 350 - Code Requirements for Environmental Engineering Concrete Structures and Commentary.
 - 7. Manual of Concrete Practice.
- B. ASTM International (ASTM):
 - 1. C29 - Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate.
 - 2. C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 3. C33 - Standard Specification for Concrete Aggregates.
 - 4. C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 5. C40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
 - 6. C42 - Standard Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - 7. C88 - Standard Test Method of Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
 - 8. C94 - Standard Specification for Ready-Mixed Concrete.
 - 9. C114 - Standard Test Methods for Chemical Analysis of Hydraulic Cement.
 - 10. C117 - Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
 - 11. C123 - Standard Test Method for Lightweight Particles in Aggregate.
 - 12. C131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - 13. C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 14. C138 - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
 - 15. C142 - Standard Test Method for Clay Lumps and Friable Particles in Aggregate.
 - 16. C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete.

17. C150 - Standard Specification for Portland Cement.
18. C156 - Standard Test Method for Water Loss from a Mortar Specimen Through Liquid Membrane-Forming Curing Compounds for Concrete.
19. C157 - Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
20. C171 - Standard Specifications for Sheet Materials for Curing Concrete.
21. C172 - Standard Practice for Sampling Freshly Mixed Concrete.
22. C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
23. C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
24. C293 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading).
25. C295 - Standard Guide to Petrographic Examination of Aggregates for Concrete.
26. C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
27. C311 - Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete.
28. C494 - Standard Specification for Chemical Admixtures for Concrete.
29. C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
30. C702 - Standard Practice for Reducing Samples of Aggregate to Testing Size.
31. C856 - Standard Practice for Petrographic Examination of Hardened Concrete.
32. C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.
33. C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
34. C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
35. C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
36. C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
37. C1260 - Standard Test Method of Potential Alkali Reactivity of Aggregates (Mortar Bar Method).
38. C1293 - Standard Test Method for Determination of Length Change of Concrete due to Alkali-Silica Reaction.
39. C1567 - Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).
40. C1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
41. C1778 - Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete.
42. D29 - Standard Practice for Determining Volatile and Nonvolatile Content of Cellulosics, Emulsions, Resin Solutions, Shellac, and Varnishes.
43. D75 - Standard Practice for Sampling Aggregates.
44. D2103 - Standard Specification for Polyethylene Film and Sheeting.
45. D3665 - Standard Practice for Random Sampling of Construction Materials.
46. D4791 - Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

- C. National Ready-Mixed Concrete Association (NRMCA).
- D. NSF International (NSF):
 - 1. 61 - Drinking Water System Components - Health Effects.

1.03 DEFINITIONS

- A. Alkali: The sum of sodium oxide and potassium oxide calculated as sodium oxide.
- B. Alkali load: Amount of alkalies contributed by the portland cement in a concrete mixture, expressed in pounds per cubic yard (lb/yd³) and calculated by multiplying the portland cement content of the concrete in lb/yd³ by the alkali content of the portland cement, or the portland cement portion of a blended cement, divided by 100.
- C. Architectural concrete: Concrete surfaces that will be exposed to view in the finished work.
 - 1. For purposes of this Section, includes only those surfaces that receive paint or coatings.
 - 2. Exposed concrete surfaces in open basins, channels, and similar liquid containing structures: Surfaces will be considered exposed to view if located above the water line as defined in Section 03366 - Tool Concrete Finishing.
 - 3. Exterior concrete surfaces with portions above and below grade: Surface will be considered exposed to view if located above the grade line as defined in Section 03366 - Tool Concrete Finishing.
- D. Average daily temperature: Calculated by summing hourly measurements of air temperature in the shade at the face of the concrete and dividing that sum by 24. In calculating the sum of the temperatures recorded, any measurement less than 50 degrees Fahrenheit shall be recorded as 0 degrees Fahrenheit and included in the sum.
- E. Cementitious materials: Portland cement and supplementary cementitious materials.
- F. Class of concrete: Refers to a mix with characteristics, proportions, and constituents (including a specific combination of admixtures) as specified in this Section.
 - 1. Any change in the source or characteristics of constituent materials, in the proportions of materials, or in the admixtures included in a mix shall be considered as creating a new and separate class of concrete.
 - 2. Any mix to be placed by pumping shall be considered as creating a new and separate class of concrete.
- G. Cold weather: Includes one or more of the following conditions:
 - 1. Current air temperature is 45 degrees Fahrenheit and falling.
 - 2. Air temperature during the first 24 hours after placement is expected to fall into the range of 45 degrees Fahrenheit to 40 degrees Fahrenheit.
 - 3. A period when, for more than 3 consecutive days, the following conditions exist:
 - a. The average daily air temperature drops below 40 degrees Fahrenheit.
 - b. The air temperature is not greater than 50 degrees Fahrenheit for more than one-half of any consecutive 24-hour period.

- H. Cold weather concreting: Operations for placing, finishing, curing, and protecting concrete during cold weather.
- I. Green concrete: Concrete that has not yet achieved 100 percent of the minimum specified compressive strength, f'_c , for that mix.
- J. Hairline crack: Crack with a crack width of less than 4 thousandths of an inch (0.004 inches).
- K. Hot weather: Any combination of ambient temperature, concrete temperature, relative humidity, wind speed, and solar radiation intensity that creates conditions that will evaporate water from a free concrete surface at a rate equal to or greater than 0.2 pounds per square foot per hour as determined by the Menzel Formula and monograph published in ACI 305R and included as Attachment A to this Section.
- L. Hot weather concreting: Operations for placing, finishing, curing, and protecting concrete during hot weather.
- M. Mass concrete: Concrete with a thickness of more than 36 inches.
- N. Paste content: The total concrete volume minus the volume of aggregate, expressed as a percentage of total volume. Paste volume includes volume of cementitious materials, water, air, admixtures materials, and any fibers.
- O. Supplemental cementitious material: inorganic material such as fly ash, natural pozzolans, silica fume, or slag cement that reacts pozzolanically or hydraulically.

1.04 DELEGATED DESIGN

- A. Provide Delegated Design for the following Work, based on the requirements of this Section.
 - 1. Concrete mix designs.

1.05 SUBMITTALS

- A. General:
 - 1. Data for concrete mixes and mix constituents supplied to the Work shall be coordinated through a single supplier.
 - 2. A maximum of 2 mix designs will be reviewed by the Engineer for each class of concrete required.
 - a. Review of additional mix designs shall be at the expense of the Contractor.
- B. Product data:
 - 1. Submit data completely describing products and demonstrating compliance with the requirements of this Section.
 - 2. Data for all products in the mix for each class of concrete shall be submitted concurrently with that mix design.
 - 3. Where products conforming to NSF-61 are required, submit evidence of testing and listing under NSF-61 for use in direct contact with potable water.

Testing and listing shall be by a nationally recognized agency acceptable to the Engineer.

a. NSF-61 conformance under this section is required only for cement, admixtures, and related materials used in construction of the strand-wound circular prestressed concrete tank. See Section 13207 for additional material requirements.^{AD2}

4. Admixtures:

- a. For each admixture included in concrete mixes, submit manufacturer's product data demonstrating compliance with standards specified.
- b. If air entraining admixture requires test method other than ASTM C173 to accurately determine air content, make special note of requirements in submittal.

5. Curing compound: Submit complete data on proposed compound.

C. Design data:

1. Concrete mix designs:

- a. Submit full details, including mix design calculations and plots, for concrete mixes proposed for use for each class of concrete.
- b. Include mix design calculations of proportions by both weight and volume.
- c. Determine and include the alkali load of the proposed mix.
- d. Include information on correction of batching for varying moisture contents of fine aggregate.
- e. Submit source quality test records with mix design submittal.
- f. Provide calculations demonstrating that the mixes proposed provide the required average compression strength of concrete (f_{cr}) based on source quality test records.
- g. For each Class A mix design submitted, plot the mix design on a "Coarseness Factor Chart" as shown in Attachment B.
- h. For each Class A mix design submitted, plot the combined aggregate gradation on the chart shown in Attachment C.

D. Concrete mixes - Trial batches:

1. Contractor shall perform and pay for trial batch testing.
2. Drying shrinkage test results.
 - a. Submit results of testing.
 - b. Submit test specimens from drying shrinkage tests for trial batches.
 - 1) Submit all specimens from each mix accepted by Engineer.
 - 2) Using indelible marker, clearly label each specimen with concrete class, trial batch mix designator, and specimen number.
3. Compression strength test results.
 - a. Submit results of testing. Provide data for each cylinder tested.
 - b. Submit data indicating trial batch mix designator, slump, and specimen number for each test cylinder.
 - c. Submit test specimens from compression strength tests for trial batches.
 - 1) Submit 2 cylinders from each mix accepted by Engineer.
 - 2) Using indelible marker, clearly label each cylinder with concrete class, trial batch number, and specimen number.
4. If there is any change in suppliers or in quality of concrete mix constituents, submit new test data.

E. Test reports:

1. Dated not more than 18 months prior to the date of submittal.

2. Aggregate:
 - a. Submit certified copies of commercial laboratory tests proposed for use in concrete.
 - b. Sieve analyses:
 - 1) During construction, submit sieve analyses of coarse, fine, and combined aggregates used any time there is a change in supplier, or a significant change in the character and/or grading of materials, and when requested by the Engineer.
 - c. Aggregates - coarse:
 - 1) Physical properties:
 - a) Sieve analysis.
 - b) Percentage of particles having flat and/or elongated characteristics.
 - c) Abrasion loss.
 - d) Soundness.
 - 2) Deleterious substances:
 - a) Clay lumps and friable particles content.
 - b) Materials finer than 200 sieve (percentage).
 - c) Shale and chert content.
 - d) Coal and lignite content.
 - 3) Alkali reactivity.
 - 4) Deleterious substances:
 - a) Clay lumps and friable particles content.
 - b) Chert and shale content.
 - c) Coal and lignite content.
 - d) Materials finer than No. 200 sieve.
 - 5) Alkali reactivity.
 - d. Aggregates - Fine:
 - 1) Physical properties:
 - a) Sieve analysis and fineness modulus.
 - b) Soundness.
 - 2) Deleterious substances:
 - a) Clay lumps and friable particles (percentage).
 - b) Materials finer than No. 200 sieve (percentage).
 - c) Coal and lignite (percentage).
 - d) Shale and chert.
 - e) Organic impurities ("Color" as determined by ASTM C40).
 - 3) Alkali reactivity.
 - e. Aggregates - Combined:
 - 1) Test combined gradation for the following sieve sizes: 1.5 inches, 1 inch, 3/4 inch, 1/2 inch, 3/8 inch, Number 4, Number 8, Number 16, Number 30, Number 100, Number 200.
 - 2) Bulk density in accordance with ASTM C29.
 - 3) Void content in accordance with ASTM C29.
 - 4) Submit at:
 - a) Initial mixture design submittal.
 - b) Intervals of not more than 4 weeks.
 - c) Any time there is a change in character or grading of constituent materials.
 - d) When requested by the Engineer.

3. Cement:
 - a. Mill tests, including alkali content measured as equivalent alkalis, for each shipment of cement included in the Work.
 - 1) During construction, submit mill certificates for cement being used at intervals of not more than 90 days, any time there is a change in supplier or a significant change in the character of the materials, and when requested by the Engineer.
 4. Supplemental cementitious material:
 - a. Fly ash: Identify source and provide testing results to demonstrate compliance with requirements of ASTM C618 and this Section.
 - b. Slag cement: Identify source and provide testing results to demonstrate compliance with requirements of ASTM C989 and this Section.
- F. Certificates:
1. Current NRMCA certification for all plants and trucks that will be used to supply concrete.
- G. Source quality control submittals:
1. Truck batch tickets for each load of concrete delivered to the site, whether accepted or rejected.
 2. Concrete supplier's quality control plan. Include the following elements, at a minimum:
 - a. Names and qualifications of key quality control personnel:
 - 1) Quality control manager.
 - 2) Testing and inspection personnel.
 - b. Names and qualifications of testing laboratories:
 - 1) Each laboratory shall hold current accreditation from the AASHTO Accreditation Program, or other accreditation program acceptable to the Engineer, for each test performed.
 - c. Example forms for: inspection reports, certificates of compliance, and test results.
 - d. Quality control procedures: Method and frequency of performing each procedure, including inspections and materials testing. At a minimum, the plan shall include:
 - 1) Daily testing of aggregate gradation.
 - 2) Monthly testing of cement quality.
 - 3) Monthly testing of fly ash quality.
 - e. Procedures to control quality characteristics, including standard procedures to address properties outside the specified operating limits, and example reports to document non-conformances and corrective actions taken. Include procedure for notifying Contractor and Engineer of non-conformances.
 - f. Procedures for verifying that:
 - 1) Materials are properly stored during concrete batching operations.
 - 2) Batch plants have the ability to maintain concrete consistency during periods of extreme heat and of low temperatures.
 - 3) Admixtures are dispensed in the correct dosages within the accuracy requirements specified.
 - 4) Delivery trucks have a valid NRMCA certification card.

- g. Procedures for verifying that weighmaster certificate for each load of concrete shows:
 - 1) Cement and supplementary materials are from sources designated in the approved submittals.
 - 2) Concrete as-batched complies with the constituent weights designated in the approved submittals.
 - 3) Corrections for aggregate moisture are being correctly applied.
 - 4) Any mix water withheld from the batch.
 - h. Procedures for visually inspecting concrete during discharge.
- H. Field quality control submittals:
- 1. Contractor's notifications of readiness for concrete placement.
 - 2. ~~Contractor's reports of field quality control testing~~Contractor's documentation of delivered concrete for field quality control testing by the Construction Manager^{AD3}.
 - a. Include with each ~~report~~concrete delivery^{AD3} the concrete batch ticket number and identification numbers for associated cylinders used for compressive strength testing.
 - ~~b. Testing results for slump, temperature, unit weight, and air entrainment.~~
 - ~~c. Testing results for compressive strength at 7 and 28 days, and for any compressive strength tests after 28 days.~~^{AD3}
 - ~~d.b.~~ Note on batch ticket the amount of water that was withheld and the maximum amount that can be added on site as "Max add water." Record on the batch ticket the volume of water actually added at site.
 - ~~e.c.~~ Note on the batch ticket the concrete mix classification as defined in Table 3, Concrete Classes.
- I. Special procedure submittals:
- 1. Sequence of concrete placing:
 - a. Submit proposed sequence of placing concrete showing proposed beginning and ending of individual placements. Submittal shall include plans sections and details to address all pours.
 - 2. Cold weather concreting plan.
 - 3. Hot weather concreting plan.
 - 4. Repair of defective concrete: Submit mix design for repair materials to be used.

1.06 QUALITY ASSURANCE

- A. Pre-installation meetings:
- 1. Schedule and conduct pre-installation meeting at least 10 days prior to batching and placing of concrete.
 - a. Provide additional meetings if necessary, to discuss specific concrete submittals, mixes, or placing and curing conditions.
 - b. Notify Engineer of location and time of each conference.
 - 2. Required attendees:
 - a. Contractor including Contractor's superintendent and key personnel.
 - b. Concrete supplier.
 - c. Technical representative(s) of supplier(s) of concrete admixtures.
 - d. Subcontractor(s) providing pumping, placing, finishing, and curing.
 - e. Subcontractor(s) providing embedded items (structural embedded plates, electrical conduit).

- f. Sampling and testing personnel.
 - g. Engineer.
 - h. On-site inspectors representing Engineer.
 - i. Other persons deemed by the Engineer and the Contractor to be critical to the quality and efficiency of the Work.
- 3. Agenda:
 - a. Review of requirements of Drawings and Specifications.
 - b. Project and product safety requirements.
 - c. Discussion of points of interface and coordination between various trades or products to be used in the Work.
 - d. Contractor's schedule for cast-in-place concrete work.
 - e. Mix designs, mix tests, and submittals.
 - f. Admixture types, dosing, performance, requirements for monitoring, and limits on dosing or re-dosing at the site.
 - g. Placement and consolidation methods, techniques, and equipment and the effects of those methods on form pressures.
 - h. Slump and limits on placing time or conditions to maintain placeability.
 - 1) Field adjustment of slump and air content.
 - i. Procedures for finishing, curing, and retention of moisture during these operations.
 - j. Procedures and protection for hot and cold weather conditions.
 - k. Requirements and coordination for inspections.
 - 1) Responsibility for test specimen curing and storage.
 - 2) Distribution of test reports.
 - l. Other Specification requirements requiring coordination between parties to the work.
- 4. Prepare and submit minutes of the pre-installation meeting as specified in Section 01312 - Project Meetings.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Packing and shipping:
 - 1. Deliver, store, and handle concrete materials in manner that prevents damage and inclusion of foreign substances.
 - 2. Deliver and store packaged materials in original containers until ready for use.
 - 3. Deliver aggregate to mixing site and handle in such manner that variations in moisture content will not interfere with steady production of concrete of specified degree of uniformity and slump.
- B. Acceptance at site:
 - 1. Reject material containers or materials showing evidence of water or other damage.
 - 2. Concrete mixes: Do not accept or incorporate into the Work concrete mixes that do not comply with the specified requirements for water content, slump, temperature, and air content.

1.08 PROJECT CONDITIONS

- A. Cold weather concreting: During periods of cold weather as defined in this Section, implement cold weather concreting procedures in this Section.

- B. Hot weather concreting: During periods of hot weather as defined in this Section, implement hot weather concreting procedures in this Section.

1.09 SEQUENCING AND SCHEDULING

- A. Schedule placing of concrete in a manner that completes all placing operations from one construction, control, or expansion joint to another construction, control, or expansion joint.
- B. Joints at each end of the placement shall be as indicated on the Drawings, or as identified and accepted in advance by the Engineer.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. It is the intent of this Section to secure, for every part of the Work, concrete with a homogeneous mixture, that, when hardened, will have required strength, watertightness, and durability.
- B. It is the intent of this Section to procure a workable, low-shrinkage concrete mix that maximizes aggregate content and minimizes paste content.
- C. Performance requirements:
 - 1. General:
 - a. Except as otherwise specified, provide concrete composed of portland cement, supplemental cementitious materials, aggregate, admixtures and water, proportioned and mixed to produce a plastic, workable mixture in accordance with requirements of this Section, and suitable to specific conditions of placement.
 - b. Proportion aggregates to produce an optimized gradation of aggregate that combines fine and coarse aggregate in well-graded proportions that maximizes the aggregate content and minimizes the paste content of the mix. The gradation should maximize long-term durability and strength of the concrete mixture. Durability requirements will be deemed to be satisfied when:
 - 1) The mixture is proportioned with a well-graded combined aggregate.
 - 2) The specified water-cement ratio is satisfied.
 - 3) The concrete contains the specified range of air content.
 - 4) The maximum specified paste content is satisfied.
 - 5) The requirements of ASTM C1778 to reduce the risk of deleterious alkali-aggregate reactions are satisfied. Reduce alkali loading of concrete, provide minimum supplemental cementitious material content, or both as required.
 - a) Size and Exposure Conditions (ASTM C1778, Table 2): Concrete exposed to humid air, buried or immersed Concrete exposed to alkalis in service.
 - b) Structure Class (ASTM C 1778, Table 3): Class SC3 Class SC 4.
 - c. Proportion materials in a manner that will secure the lowest cement content, water-cementitious materials ratio, and paste volume that is

- consistent with good workability, that provides a plastic and cohesive mixture, and that provides a slump that is within the specified range.
 - d. Construction and expansion joints have been positioned in structures as indicated on the Drawings, and curing methods have been specified, for purpose of to reduce the number and size of cracks, resulting from normal expansion and contraction expected from the concrete mixes specified.
 - e. Remove and replace, or repair as specified in Part III, non-conforming work and surfaces with cracks, voids and honeycombs, or surface wetness.
2. Workmanship and methods: Provide concrete work, including detailing of reinforcing, conforming with best standard practices and as set forth in ACI 318, ACI 350, and the ACI Manual of Concrete Practice.

2.02 MATERIALS - GENERAL

- A. Water and ice:
- 1. Water for concrete mixes, for washing aggregate, and for curing concrete: Clean and free from oil and deleterious amounts of alkali, acid, organic matter, or other substances.
 - 2. Do not exceed the optional chemical limits in accordance with ASTM C1602.
 - 3. Do not use water recycled from previously returned fresh concrete.

2.03 MATERIALS - CONCRETE MIX CONSTITUENTS

- A. Water and ice:
- 1. As specified in the preceding paragraphs.
- B. Cementitious materials:
- 1. Portland cement:
 - a. In accordance with ASTM C150.
 - 1) Type II.
 - 2) Single source: To provide uniformity of appearance, for each structure use only one source, type, and brand of portland cement for walls and slabs that will be exposed in the finished work.
 - 3) Confirm adequate supply of cement over duration of project before making trial batches or beginning concrete placements.
 - b. Cement for finishing: Provide cement from same source and of same type as concrete to be finished or repaired.
 - c. In accordance with NSF 61.
- C. Supplementary cementitious materials:
- 1. Fly ash:
 - a. Class C or Class F fly ash in accordance with the requirements of ASTM C618, except as modified in this Section.
 - 1) Class C, may be used in concrete made with Type II portland cement.
 - 2) Class F required if used in concrete mixes containing aggregates classified as potentially reactive based on ASTM C1293 or ASTM C1260 evaluation for alkali-silica reactivity.
 - a) CaO content: Less than 18 percent.
 - b. Loss on ignition: Not exceeding 3 percent.
 - c. In accordance with NSF 61.

- d. Replace portland cement at ratio of 1.0 pound fly ash for each pound of cement, up to minimum and maximum replacement as specified in "Requirements for Mix Proportioning."
- 2. Slag cement:
 - a. Grade 80, 100, or 120 in accordance with ASTM C989, except as modified below:
 - 1) Fineness: Amount retained on a No. 325 sieve: 20 percent maximum.
 - 2) Total alkalies $\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$:
 - a) Minimum: 0.60 percent.
 - b) Maximum: 0.90 percent.
 - b. In accordance with NSF 61.

D. Admixtures:

- 1. General:
 - a. Do not include admixtures, other than those specified, unless written acceptance has been obtained from the Engineer during submittal of mix designs.
 - b. Admixtures shall be compatible with concrete constituents and with other admixtures.
 - 1) All admixtures in a given mix shall be products of the same manufacturer to ensure compatibility.
 - 2) Admixture manufacturers: One of the following, or equal.
 - a) BASF Corp., Master Builders Solutions.
 - b) Euclid Chemical.
 - c) GCP Applied Technologies (formerly W.R. Grace).
 - d) Sika Corp.
 - c. Admixtures shall be tested and listed under NSF-61 for use in direct contact with potable water.
 - d. Do not use admixtures containing chlorides, calculated as chloride ion, in excess of 0.5 percent by weight of cement.
 - e. Use in accordance with manufacturer's recommendations. Add each admixture to concrete mix separately.
 - f. Admixtures used shall be the same products used in concrete trial batches, or the same products used in concrete represented by submitted field test records.
- 2. Air entraining admixture (AEA):
 - a. In accordance with ASTM C260, and dosed to provide entrained air percentages specified in this Section.
 - b. Provides entrained air as bubbles, evenly dispersed at the time of placement and during curing.
- 3. Water reducing admixture (WRA):
 - a. May be used at the Contractor's option.
 - b. Conforming to ASTM C494, Type A (water-reducing).
 - 1) ASTM C494, Type D (water-reducing and retarding) may be used during periods of hot weather with prior acceptance by the Engineer.
 - c. Not containing air-entraining agents.
 - d. Liquid form before adding to the concrete mix.
- 4. High range water reducing admixtures ("super-plasticizers") (HRWR):
 - a. Not permitted without acceptance by Engineer.

5. Shrinkage reducing admixture (SRA):
 - a. May be used at Contractor's option.
 - 1) Provide shrinkage reducing admixture in sufficient dosage so as to produce shrinkage within the limits specified.
 - b. Not containing expansive agents.
 - c. In accordance with ASTM C494, Type S (specific performance).
 - d. One of the following, or equal:
 - 1) BASF Corporation, Master Builders Solutions: SRA Series.
 - 2) Euclid Chemical: Eucon SRA Series.
 - 3) GCP Applied Technologies: Eclipse Series.
 6. Set-controlling admixtures:
 - a. Shall not be used without prior acceptance from Engineer.
- E. Coloring admixtures:
1. Conduit encasement coloring agent:
 - a. Red color concrete used for encasement of electrical ducts, conduits, and similar type items.
 - b. Manufacturers: One of the following or equal:
 - 1) Davis Co., #100 Utility Red.
 - 2) I. Reiss Co., Inc., equivalent product.
 - 3) Euclid Chemical Co., Increte Division, "Colorcrete Brick Red."
 - c. Conduit encasement concrete: Mix into each cubic yard of concrete 10 pounds of coloring agent.
- F. Aggregate:
1. General:
 - a. Provide concrete aggregates that are sound, graded as specified, and free of deleterious material in excess of allowable amounts specified.
 - b. Provide aggregates to produce in place concrete with unit weight as follows:
 - 1) Normal weight concrete: Not less than 140 pounds per cubic foot.
 - c. Do not use aggregate made from recycled materials such as crushed and screened hydraulic-cement concrete, brick, and other construction materials.
 - d. Do not use aggregate recycled from fresh concrete returned to the batching facility.
 - e. In accordance with NSF 61.
 2. Alkali-silica reactivity:
 - a. Provide aggregate classified as aggregate-reactivity class of R0 in accordance with ASTM C1778 with expansion not greater than 0.10 percent at 14 days when tested in accordance with ASTM C1260, unless the aggregate has been determined to be not deleteriously reactive based on testing in accordance with the following:
 - 1) ASTM C1293: Expansion not greater than 0.04 percent at 1 year.
 - b. Aggregates classified as potentially reactive based on the preceding tests may be permitted, at the discretion of the Engineer, if the following condition is satisfied:
 - 1) ASTM C1567: Testing with the reactive aggregate, cement, and supplemental cementitious materials demonstrate that expansion is less than 0.10 percent at 14 days.

3. Fine aggregate:
 - a. Material graded such that 95 to 100 percent of material passes the No. 4 (4.75 mm) sieve, when sampled in accordance with ASTM D75 and D3665, and tested in accordance with ASTM C136.
 - b. Provide fine aggregate consisting of clean, natural sand, or sand prepared from crushed stone or crushed gravel.
 - c. In accordance with ASTM C33 requirements for grading, deleterious substances, soundness, and alkali reactivity, except as modified in the following paragraphs.
 - 1) Grading: For sieve sizes listed in ASTM C33 for fine aggregate, not more than 45 percent passing any sieve and retained on the next consecutive sieve.
 - 2) Deleterious substances: not in excess of the percentages by weight specified in Table 1.

Table 1: Fine Aggregate, Limits on Deleterious Substances		
Item	Test Method	Percent (maximum)
Materials finer than No. 200 sieve ⁽²⁾	ASTM C117	3.00 ⁽²⁾
Clay lumps and friable particles	ASTM C142	1.00
Lightweight particles (SG < 2.40)	ASTM C123	1.00
• Chert or shale ⁽¹⁾	ASTM C295	1.00 ⁽¹⁾
Coal and lignite	ASTM C123	0.50
Notes: (1) ASTM C123 tests for particles in the sample having a specific gravity less than 2.40. ASTM C295 is used to identify which of those lightweight particles are chert, shale, or coal and lignite. If testing under ASTM C123 indicates a combined percentage of lightweight particles (sum of shale, chert, coal and lignite) not greater than 1.00, testing under ASTM C295 will not be required. (2) For manufactured sand, if material finer than the No. 200 sieve consists of crusher dust and the aggregate is essentially free of clay or shale, maximum percentage may be increased to 5.0 percent.		

- 3) Organic impurities: Free of injurious amounts of organic matter and producing a supernatant liquid with color not darker than "standard color" when tested in accordance with ASTM C40.
 - 4) Soundness: In accordance with requirements of ASTM C33 when tested in accordance with ASTM C88 using sodium sulfite solution.
4. Coarse aggregate:
 - a. Materials graded such that not more than 10 percent of material passes the 3/8-inch sieve, when sampled in accordance with ASTM D75 and D3665, and tested in accordance with ASTM C136.
 - b. Consisting of gravel, crushed gravel, crushed stone, or a combination of these materials having clean, hard, durable particles free from calcareous coatings, organic matter, or other deleterious substances.
 - c. Conforming to the requirements of ASTM C33 for physical properties, deleterious substances, and alkali reactivity, except as modified in the following paragraphs.
 - 1) Grading:
 - a) Size number as specified in ASTM C33, and as indicated in Table 3 - Concrete Classes, except as otherwise specified or accepted by the Engineer.

- b) Weights of flat or elongated particles (particles having a length greater than 3 times average width or thickness) not exceeding 15 percent when tested in accordance with ASTM D4791.
- 2) Deleterious substances: Not in excess of the percentages by weight specified in Table 2 and having total of all deleterious substances exceeding 2 percent.

Table 2: Coarse Aggregate, Limits on Impurities		
Item	Test Method	Percent (maximum)
Clay lumps and friable particles	ASTM C142	0.50
Lightweight particles (SG < 2.40)	ASTM C123	1.25
• Chert or shale(1)	ASTM C295	1.00 ⁽¹⁾
Materials finer than No. 200 sieve	ASTM C117	0.50 ⁽²⁾
Coal and lignite	ASTM C123	0.25
Notes: (1) ASTM C123 tests for particles in the sample having a specific gravity less than 2.40. ASTM C295 is used to identify which of those lightweight particles are chert, shale, or coal and lignite. If testing under ASTM C123 indicates a combined percentage (sum of shale, chert, coal and lignite) not greater than 1.25, testing under ASTM C295 will not be required. (2) When material finer than No. 200 sieve consists of crusher dust, maximum percentage may be increased to 1.00 percent. When mix design complies with provisions of ASTM C33, Table 4, footnote C, the maximum percentage may be increased in accordance with the equation in footnote C, up to a maximum of 1.5 percent.		

- 3) Abrasion loss: Loss not greater than 45 percent after 500 revolutions when tested in accordance with ASTM C131.
- 4) Soundness: Loss not greater than 10 percent when tested in accordance with ASTM C88 using sodium sulfate solution.

2.04 MATERIALS FOR PLACING, CURING AND FINISHING

- A. General:
 - 1. Materials shall be compatible with concrete and with other materials.
 - 2. Materials for placing, curing and finishing concrete that will be in contact with potable water:
 - a. Non-toxic and shall not impart taste or odor to the water.
 - b. Listed under NSF-61 for use in contact with potable water.
- B. Cement grout:
 - 1. Use: For spreading over surface of construction and cold joints in concrete before placing additional concrete above those joints.
 - 2. As specified in Section 03600 - Grouting.
- C. Concrete sealer:
 - 1. As specified in Section 03366 - Tooled Concrete Finishing.
 - 2. Not for use in water-containment structures.
- D. Evaporation retardant:
 - 1. Tested and listed under NSF-61 for use direct contact with potable water.
 - 2. Use: For mitigating surface moisture evaporation from freshly placed concrete during rapid drying conditions. Placed after screeding.

3. Waterborne, monomolecular, spray-applied compound, with fugitive dye to indicate coverage.
 4. Manufacturers: One of the following or equal:
 - a. BASF, Confilm.
 - b. Euclid Chemical Co., Eucobar.
- E. Nonslip abrasive:
1. Aluminum oxide abrasive size 8/16, having structure of hard aggregate that is, homogenous, nonglazing, rustproof, and unaffected by freezing, moisture, or cleaning compounds.
 2. Manufacturers: One of the following or equal:
 - a. Exolon Co.
 - b. Abrasive Materials, Inc.
 - c. "Non-Slip Aggregate", Euclid Chemical Co.
- F. Plastic membrane for curing:
1. Polyethylene film: In accordance with ASTM C171.
 2. Properties:
 - a. Color: White.
 - b. Thickness: Nominal thickness of polyethylene film shall not be less than 0.0040 inches when measured in accordance with ASTM D2103. Thickness of polyethylene film at any point shall not be less than 0.0030 inches.
 - c. Loss of moisture: Not exceed 0.055 grams per square centimeter of surface when tested in accordance with ASTM C156.
- G. Sprayed membrane curing compound:
1. Tested and listed under NSF-61 for use direct contact with potable water.
 2. Combination curing and sealing products ("cure and seal") will not be permitted.
 3. Properties:
 - a. Clear type with fugitive dye conforming with ASTM C309, Type 1D and containing no wax, paraffin, or oils.
 - b. For concrete placed or cured during hot weather, curing compound shall be as specified, except that:
 - 1) It shall include a white, reflective fugitive dye.
 - 2) Moisture loss during a 72-hour period shall not exceed 9 pounds per cubic yard when tested in accordance with ASTM C156.
- H. Surface-applied sealing system:
1. Tested and listed under NSF-61 for use direct contact with potable water.
 2. Manufacturers: One of the following or equal:
 - a. Euclid Chemical Co., Vandex Super.
 - b. Kryton International, Inc., Krystol T1.
 - c. Xypex Chemical Corp., Xypex Concentrate.
 3. Where surface-applied sealing system is placed over concrete containing permeability reducing admixture for concrete exposed to hydrostatic conditions (PRAH), provide products of same manufacturer providing the admixture.

2.05 EQUIPMENT

- A. General:
 - 1. Provide adequate equipment and facilities for accurate measurement and control of materials and for readily changing proportions of material into mixers.
- B. Batching equipment, or batch plant.
 - 1. Capable of controlling delivery of all material to mixer within 1 percent by weight of individual material.
- C. Mixing equipment:
 - 1. Mixers may be of stationary plant, paver, or truck mixer type, as appropriate to the Work.
 - 2. Capable of combining aggregates, water, and cementitious materials, and admixtures within specified time into a thoroughly mixed and uniform mass, and of discharging the mixture without segregation.
 - a. Maintain concrete mixing equipment in good working order, and operate at loads, speeds, and timing recommended by manufacturer or as specified.
 - b. Proportion cementitious materials and aggregate by weight.
 - 3. If bulk cementitious materials are used, weigh them on separate visible scale which will accurately register scale load at any stage of weighing operation from zero to full capacity.
 - 4. Prevent cementitious materials from coming into contact with aggregate or with water until materials are in mixer ready for complete mixing with all mixing water.
 - 5. Procedure of mixing cementitious materials with sand or with sand and coarse aggregate for delivery to project site, for final mixing and addition of mixing water will not be permitted.
 - 6. Retempering of concrete will not be permitted.
 - 7. Discharge entire batch before recharging.
 - 8. Volume of mixed material per batch: Not exceed manufacturer's rated capacity of mixer.
 - 9. Equip each mixer with device for accurately measuring and indicating quantity of water entering concrete, and operating mechanism such that leakage will not occur when valves are closed.
 - 10. Equip each mixer with device for automatically measuring, indicating, and controlling time required for mixing:
 - a. Interlock device to prevent discharge of concrete from mixer before expiration of mixing period.
 - 11. Transit-mixed concrete:
 - a. Mix and deliver in accordance with ASTM C94.
 - b. Total elapsed time between addition of water at batch plant and discharging completed mix.
 - c. Not to exceed 90 minutes.
 - d. Elapsed time at project site shall not exceed 30 minutes.
 - e. Under conditions contributing to quick setting, total elapsed time permitted may be reduced by the Engineer.
 - f. Equip each truck mixer with device interlocked to prevent discharge of concrete from drum before required number of turns and furnish device that is capable of counting number of revolutions of drum.

12. Continuously revolve drum after it is once started until it has completely discharged its batch:
 - a. Do not add water until drum has started revolving.
 - b. Right is reserved to increase required minimum number of revolutions or to decrease designated maximum number of revolutions allowed, if necessary, to obtain satisfactory mixing. The Contractor will not be entitled to additional compensation because of such increase or decrease.
- D. Other types of mixers: For other types of mixers, mixing shall be as follows:
 1. Mix concrete until there is uniform distribution of materials, and discharge mixer completely before recharging.
 2. Neither speed nor volume loading of mixer shall exceed manufacturer's recommendations.
 3. Continue mixing for minimum of 1-1/2 minutes after all materials are in drum, and for batches larger than 1 cubic yard increase minimum mixing time 15 seconds for each additional cubic yard or fraction thereof.

2.06 CONCRETE MIXES

- A. General:
 1. Develop and provide mix design for each Concrete Class listed in Table 3 - Concrete Classes.
 2. Select and proportion mixes and document properties using one of the two methods that follow. Procedures and requirements for use of each alternative are specified in subsequent paragraphs of this Section.
 - a. Field experience method.
 - b. Trial batch method.
 3. Organize and submit mix designs with data on all constituent materials and products for that mix, for Engineer's review.
 4. Do not place concrete until the mix design for that Concrete Class has been accepted by Engineer.
 5. After acceptance, do not modify accepted mixes or provide new mixes without Engineer's prior review and acceptance of the proposed alternative.
 - a. Exception: At all times, adjust batching of water to compensate for free moisture content of the fine aggregate used.
 - b. For any change to approved mixes, Engineer may require new trial batching and testing program as specified in this Section before acceptance and use.
 - c. For any change to approved mixes, make modifications within limits set forth in this Section.
 - d. If there is change in source or quality of any constituent of the concrete class or mix, the revised mix will be considered a new class of concrete and shall require full re-submittal of all data describing mix constituents, design, and testing.
 6. Material sampling, mix designs, trial batch preparation and testing, modifications to mix designs, and any re-testing required to satisfy the requirements of this Section or to obtain satisfactory performance shall be at Contractor's expense and shall not be considered cause for delay.
- B. Measurements of materials:
 1. Measure materials by weighing, except as otherwise specified or where other methods are specifically authorized in writing by the Engineer.

2. Furnish apparatus for weighing aggregates and cementitious materials that is suitably designed and constructed for this purpose.
 3. Accuracy of weighing devices: Furnish devices that have capability of providing successive quantities of individual material that can be measured to within 1 percent of desired amount of that material.
 4. Measuring or weighing devices: Subject to review by the Engineer. Shall bear valid seal of the Sealer of Weights and Measures having jurisdiction.
 5. Weighing cementitious materials:
 - a. Weigh cementitious materials separately.
 - b. Cement in unbroken standard packages (sacks): Need not be weighed.
 - c. Weigh bulk cementitious materials and fractional packages.
 6. Measure mixing water by volume or by weight.
- C. Requirements for mix proportioning:
1. Develop and provide mixes that:
 - a. Can be readily worked into corners and angles of forms and around reinforcement, without excessive vibration, and without permitting materials to segregate or free water to collect on surface.
 - b. Prevent unnecessary or haphazard changes in the consistency of the concrete supplied.
 2. Constituent materials:
 - a. Provide concrete mixes composed of portland cement, blended aggregates, admixtures and water.
 - 1) Admixtures required for each concrete class are indicated in Table 3 - Concrete Classes. Admixtures not specifically required by that table for a specific Concrete Class are optional and may be included at the discretion of the Contractor based on Contractor's planned means and methods of construction.
 - b. In no case shall returned fresh concrete or its constituents be incorporated into concrete batched for the Work.
 3. Minimum specified compressive strength:
 - a. Minimum specified compressive strength is designated at 28 days, unless otherwise indicated in Table 3 - Concrete Classes.
 - b. For locations where the placed concrete is adequately protected and is not subjected to loads for an extended period during construction, the Contractor may request that the period for achieving the minimum specified compressive strength be extended to 56 days. If accepted by the Engineer, provide mixes that achieve at least 75 percent of their minimum specified compressive strength after 28 days.
 4. Proportions and consistency:
 - a. Ratio of water to cementitious materials, and cementitious materials content:
 - 1) Conform to maximum and minimum cementitious material content requirements specified in Table 3 - Concrete Classes.
 - 2) Cementitious materials content: Consisting of portland cement as indicated in Table 3, plus supplemental cementitious materials if aggregate testing indicates potentially reactive aggregates:
 - a) Minimum fly ash content: 15 percent of the total weight of cementitious materials.
 - b) Maximum fly ash content: 25 percent of the total weight of cementitious materials.

- c) Minimum slag cement content: 20 percent of the total weight of cementitious materials.
 - d) Maximum slag cement content: 30 of the total weight of cementitious materials.
- b. Aggregate size and content:
 - 1) Blend aggregates to produce an optimized gradation that combines well-graded coarse, intermediate, and fine aggregates in proportions that maximize the aggregate content of the mix, and that minimize the cement paste content of the mix.
 - a) Percentage of individual fractions of the combined aggregate gradation retained on individual sieve sizes: Within the range shown in Attachment C ("Tarantula Curve").
 - b) Sum of the percentages of individual fractions retained on the No. 8, No. 16, and No. 30 sieves: Greater than 20 percent.
 - c) Sum of the percentages of individual fractions retained on the No. 30, No. 50, No. 100, and No. 200 sieves: Within the range of 25 percent to 40 percent.
- c. Determine bulk density and void content of the combined gradation of aggregates in accordance with ASTM C29. Results for combined aggregates shall not be the summation of results of testing of the individual gradations.
 - 1) Sample the combined aggregate from a flowing aggregate stream or conveyor in accordance with ASTM D75. Take care to ensure that the sample is representative of the proportions of the combined aggregate of the proposed mix.
 - 2) Reduce sample of combined aggregate to test sample size in accordance with ASTM C702, Method A - mechanical splitter or Method B - quartering.
 - 3) Perform bulk density test of combined aggregate in accordance with ASTM D29, Procedure A - rodding.
 - 4) Determine void content of the combined aggregate in accordance with ASTM D29, Procedure A - rodding. Specific gravity of the combined aggregate shall be determined in accordance with ASTM C136.
- d. Paste content: Limited to the following:
 - 1) Class A mixes without air entrainment: Maximum 28 percent measured by volume.
 - 2) Class A mixes with air entrainment: Maximum 28 percent measured by volume plus the target air content.
 - 3) Paste content shall be limited to 175 percent of the void content of the combined aggregate gradation determined by ASTM C29.
- e. Total water content:
 - 1) Not exceeding the water to cementitious material ratio specified in Table 3 of this Section.
- f. Coarseness/workability (Shilstone Method):
 - 1) Proportion mixes to fall into the "Optimal" zone (Zone II) when plotted on the Coarseness Factor Chart ("Coarseness Factor" versus "Workability Factor") included as Attachment B to this Section. Provide plot for each Class A mix to be used in the Work.
 - 2) Coarseness factor (CF) for each mix shall be calculated as the percent of the combined aggregate gradation retained on the 3/8 inch

sieve, divided by the percent of the combined aggregate gradation retained on the Number 8 sieve, multiplied by 100: or:

$$CF = \frac{(\% \text{ retained on } 3/8" \text{ sieve})}{(\% \text{ retained on No. 8 sieve})} \times 100$$

- 3) Workability factor (WF) for each mix shall be the percent of the combined aggregate gradation retained on the Number 8 sieve, adjusted for cement content in the mix.
 - a) Determine volume of total cementitious material in the mix.
 - b) For each 94 pounds of portland cement content above 564 pounds per cubic yard, increase workability factor by 2.5 units.
 - c) For each 94 pounds of portland cement below 564 pounds per cubic yard, decrease workability factor by 2.5 units.
 - d) Proportion adjustment factor by linear interpolation for each fraction of 94 pounds above or below the 564 pound basis.
 - e) Example:
650 pounds per cubic yard = 564 pounds + 86 pounds.
Adjustment = (86 lb / 94 lb) x 2.5 = + 2.28.

D. Concrete Classes for use in the Work:

1. Provide concrete classes listed in Table 3 - Concrete Classes.
2. Provide normal weight concrete, having minimum weight of 140 pounds per cubic foot, unless otherwise noted.
3. Pumped concrete:
 - a. Provide pumped concrete that complies with all requirements of this Section.
 - b. Mixes placed by pumping shall be considered a sub-class of each concrete class listed in Table 3 - Concrete Classes. Prepare and submit a separate mix design for each mix to be placed by pumping.
4. Class PM concrete: In addition to the requirements of Table 3 - Concrete Classes, conform to the following:
 - a. Minimum 28 day flexural strength: 650 psi when tested in accordance with ASTM C293.
 - b. Cementitious materials content: 75 percent portland cement plus 25 percent Class F fly ash (by weight).
 - c. Aggregate:
 - 1) Minimum 55 percent coarse aggregate conforming to ASTM C33 size number 357 or size number 467.
 - 2) Substitute ASTM C33 size number 57 or size number 67 if mechanical paving equipment is not used.

Table 3: Concrete Classes									
Concrete Class ⁽¹⁾	Minimum Specified Compressive Strength at 28 days, f _c ⁽²⁾ (pounds per square inch)	Ratio of water to cementitious materials ⁽³⁾ (minimum - maximum).	Cementitious Materials Content (pounds per cubic yard of concrete by weight) ⁽⁴⁾	Cement Type	Maximum Chloride Content (percent by weight of cement)	Maximum Size of Coarse Aggregate (ASTM C33)	Air Entrainment (percent), (n/a : not applicable)	Admixtures required ^(4,5,6)	Slump Range (inches)
A	4,500	0.40 to 0.42	535 to 575	II	0.10	#57	6±1.5	AEA WRA	2 to 4
A-NA	4,500	0.40 to 0.45	535 to 575	II	0.10	#57	n/a	WRA	2 to 4
C	2,500	0.62 max.	min. 423	II	No limit	#57	6±1.5	AEA WRA	3 to 6
CE	3,000	0.62 max.	min 423	II	No limit	#8	5±1.5	AEA WRA	3 to 6
PM	5,000	0.40 - 0.45	535 to 575	II	0.15	#57	5+1.5	AEA WRA	3 to 6
<p><u>Notes:</u></p> <p>(1) Sub classes within major concrete classes are designated as follows: NA: Without air entrainment.</p> <p>(2) At locations where concrete will not be subjected to load from other elements of the structure or from Contractor's placing and/or backfilling operations, maximum time period for achievement of specified compressive strength may be extended to 56 days when accepted by the Engineer.</p> <p>(3) W/C Ratio = Ratio of water to cementitious materials (portland cement plus supplemental cementitious material) by weight. Include weight of admixtures in the water content of the mix when the quantity of the admixtures exceeds 10 ounces per 100 pounds of cement.</p> <p>(4) Cementitious material includes portland cement plus supplemental cementitious materials. If trial batch testing demonstrates that the required strength cannot be met at 28 or 56 days with the specified combined aggregate gradation and the paste content limits, cementitious material content may be increased with Engineer's approval if a shrinkage-reducing admixture (SRA) is included in the mix design.</p> <p>(5) Admixtures are designated as follows:</p> <div style="display: flex; justify-content: space-between;"> <div> <p>AEA: Air entraining admixture</p> <p>SRA: Shrinkage-reducing admixture</p> </div> <div>WRA: Water-reducing admixture</div> </div>									

- E. Install Concrete Classes in accordance with the following requirements unless otherwise indicated on the Drawings.
1. Class A concrete: Structural concrete.
 - a. Use Class A concrete at all locations unless other Classes are specified or indicated on the Drawings.
 2. Class A-NA concrete: Structural concrete without air entrainment.
 - a. Class A-NA concrete may be used in lieu of Class A at indoor slabs (not subject to freezing and thawing) where inclusion of an air-entraining admixture makes it difficult to achieve the specified concrete finish.
 3. Class C concrete: Miscellaneous concrete fill and encasement.
 - a. Class C concrete may be used for fill for unauthorized excavation, for thrust blocks and ground anchors for piping, for bedding of pipe, and where indicated on the Drawings.
 4. Class CE concrete: Use Class CE for electrical conduit encasements.
 5. ~~Class PM concrete: Use for concrete pavement, cart paths, curbs, gutters, and sidewalks~~Class PM concrete: Use for concrete pavement and cart paths^{AD3}.
- F. Concrete mix design documented by field experience:
1. Mix design:
 - a. Prepare preliminary mix design for each Concrete Class. Submit mix design with product and testing data for materials to be used in the mix for Engineer's review.
 2. Historical records for similar mix.
 - a. Determinations of similarity of materials and proportions between historical and proposed mixes shall be by the Engineer, and that shall be final.
 - b. Historical record - Materials:
 - 1) Submit with each mix design the following data for a previously-supplied concrete mix similar to that proposed for this Work.
 - 2) Records demonstrating that the previously supplied mix included similar materials and proportions as those of the proposed mix.
 - a) Documentation that the same concrete supplier will provide both mixes.
 - b) Documentation that the materials used was from the same suppliers and had essentially the same properties, demonstrated by test data, as those proposed.
 - c) Documentation that proportions of materials in the record mix are essentially the same as those proposed and that the specified compressive strength of the record mix is within 1,000 pounds per square inch of that required by this Section.
 - d) Concrete supplier's statement describing any changes made to production of the record mix during the time period reported.
 - e) Concrete supplier's statement that preparation and quality control procedures for the record mix were essentially the same as those to be employed for this Work.
 - c. Historical record - Testing:
 - 1) Submit with each record mix, corresponding test data for slump, compressive strength (with relationships for rate of strength gain between testing ages), and drying shrinkage.

- 2) Only records satisfying the following requirements will be accepted.
 - a) All tests were conducted within a period of 1-year preceding the date of the submittal.
 - b) All tests were conducted over a period including not less than 45 days.
 - c) The record of compressive strength testing includes at least 30 tests for slump and 28-day compressive strength.
 - d) The record of compressive strength tests is consecutive. In other words, it includes all tests conducted on the subject mix within the 1-year time period described above (not just selected tests during that period).
 - e) Submit concrete supplier's sworn statement confirming that all tests for the record mix have been reported.
 - f) Tests for drying shrinkage are described in subsequent paragraphs of this Section for "concrete mix design documented by trial batch preparation and testing".
 - g) Provide supplementary testing if requested by Engineer.
- d. For mixes determined to be similar and to have an acceptable test history, acceptance criteria shall be as follows.
- e. Acceptance criteria:
 - 1) Slump: All tests within limits specified for record mix.
 - 2) Compressive strength: Average compression strength for tests, as determined by ACI 318 and ACI 350 not less than minimum required average strength.
 - 3) Drying shrinkage: Within limits stated in subsequent paragraphs of this Section for "concrete mix design documented by trial batch preparation and testing."

G. Concrete mix design documented by trial batch preparation and testing:

1. Mix design and trial batches:
 - a. Prepare preliminary mix design for each Concrete Class. Submit mix design with product and testing data for each combination of materials and proportions to be used for Engineer's review.
 - 1) Determine water content of the mix based on curves showing the relation between water-cementitious materials ratio and the 7 and 28 day compressive strength of the concrete.
 - 2) Determine each curve using 4 or more points, each representing the average compressive strength value of at least 3 specimens tested at each age.
 - b. After materials and proposed mix designs have been accepted by Engineer, have trial batches for each concrete mix design prepared by Contractor's testing laboratory.
 - 1) Prepare trial batches using the cementitious materials, aggregates, and admixtures proposed to be used for the Work.
 - 2) Provide batches of sufficient quantity to determine slump, workability, consistency, setting time, and finishing characteristics, and to provide sufficient specimens for testing.
 - c. For each trial batch, make and test specimens to determine and report slump, compressive strength (with relationships for rate of strength gain between testing ages), and drying shrinkage.
 - 1) If trial batches do not produce concrete conforming to the specified requirements for slump, strength, workability, consistency, drying

- shrinkage, restrained shrinkage, and finishing, change mix proportions and, if necessary, sources of materials.
- 2) Make additional trial batches and perform additional tests until a batch that conforms to requirements of this Section is produced.
2. Testing - Slump:
 - a. Determine slump in accordance with ASTM C143.
 - b. Acceptance criterion: Slump within range specified.
 3. Testing - Compressive strength:
 - a. Prepare 4 inch diameter by 8 inch long cylinders in accordance with ASTM C31 for tests specified in this Section.
 - b. Determine average compressive strength:
 - 1) Test at least 12 cylinders from each trial batch for compressive strength in accordance with ASTM C39.
 - 2) Test 4 cylinders at 7 days, another 4 at 28 days, and another 4 at 56 days.
 - 3) Calculate average compression strength for 7 day tests, for 28 day tests, and for 56 day tests.
 - 4) Calculate ratios for:
 - a) Average 7 day strength to average 28 day strength.
 - b) Average 28 day strength to average 56 day strength.
 - c. Determine the required average compressive strength for each mix, f'_{cr} , as described in the following paragraphs:
 - 1) Calculate required average compressive strength (f'_{cr}) based on the minimum specified 28-day compressive strength, f'_c , plus a standard deviation determined from the test history available for that mix.
 - 2) Determine f'_{cr} as specified in ACI 318 and ACI 350, except as modified in the following paragraphs.
 - a) Where 15 or more 28-day compressive strength tests are available, calculate standard deviation as described in the preceding paragraphs for "concrete mix design documented by field experience." Add this standard deviation to the specified minimum compressive strength to determine the required average compressive strength (f'_{cr}) for the mix.
 - b) Where fewer than 15 compressive strength tests at 28-days are available, determine minimum required compressive strength, (f'_{cr}) from Table 4, Required Average Compression Strength, Fewer than 15 Tests Available.

Table 4: Required Average Compressive Strength, Fewer than 15 Tests Available

Minimum Specified Compressive Strength, f'_c (pounds per square inch)	Required Average Compressive Strength, f'_{cr} (pounds per square inch)
Less than 3,000	$f'_c + 1,000$
3,000 to 5,000	$f'_c + 1,200$
Over 5,000	$f'_c + 1,400$

- d. Acceptance criterion: Average compressive strength of the 4 cylinders tested at 28 days, or of the 4 cylinders tested at 56 days when permitted by the Engineer, shall equal or exceed the required average compression strength, f'_{cr} for that concrete mix design.

4. Testing – Chloride content:
 - a. Submit test results showing that the concrete mix contains water-soluble chloride ion content contributed from the constituents including water, aggregates, cementitious materials, and admixtures is less than the limit specified in Table 3. Test shall be performed in accordance with ASTM C1218 at age between 28 and 42 days.
5. Testing - Drying shrinkage - Prism specimens:
 - a. Class A (including A, A-NA, A-SP, and A-NA-SP) and Class PM: From trial batch for each mix, prepare 10 drying shrinkage specimens in accordance with ASTM C157. Divide specimens into 2 groups of 5 specimens each: One group including shrinkage-reducing admixture, and one group without shrinkage-reducing admixture.
 - b. Prepare, cure, and test both groups in accordance with ASTM C157, except as modified in the following paragraphs.
 - 1) Remove drying shrinkage specimens from molds at age of 23 hours plus or minus 1 hour after trial batching.
 - a) Immediately place them in lime-saturated water maintained at 73 degrees Fahrenheit plus or minus 3 degrees for at least 30 minutes.
 - b) Remove specimens from the water, and wipe with a damp cloth.
 - c) Measure to nearest 0.0001 inch to determine original length.
 - d) Record measurements and re-submerge specimens in lime-saturated water at 73 degrees Fahrenheit plus or minus 3 degrees for moist curing.
 - 2) Maintain submerged curing conditions at 73 degrees Fahrenheit plus or minus 3 degrees for 7 days. 7 days after batching, remove specimens from water and repeat measuring procedures.
 - 3) Immediately store specimens in a humidity controlled room maintained at 73 degrees Fahrenheit plus or minus 3 degrees, and at 50 percent relative humidity plus or minus 4 percent for remainder of the test.
 - 4) At periods of 14, 21, 28 and 56 days after batching, remove specimens from curing room and repeat measurements.
 - c. Drying shrinkage test report:
 - 1) Report measurements of all specimens at 1, 7, 14, 21, 28, and 56 days after batching.
 - 2) Using measured length at 7 days as base length for drying shrinkage, calculate the following for each measuring period:
 - a) Drying shrinkage of each specimen. Determine as difference between the 7-day base length and measured length for each period.
 - b) Average of these differences. If drying shrinkage of any specimen departs from the average of the measurements for each period by more than 0.0004 inch, disregard results obtained from that specimen.
 - c) Percentage of drying shrinkage from batching to date of measurement.
 - d. Drying shrinkage acceptance criteria:
 - 1) Average shrinkage of trial batch concrete specimen group at 28 days after batching, when measured and cured as indicated, shall not exceed 0.035 percent.

- e. Mixes accepted by Engineer:
 - 1) Retain drying shrinkage test specimens. Bag in re-sealable plastic bags and submit to Engineer.
 - 2) Indicate trial batch identifier, specimen number, and date of final measurements on each specimen bag.
- 6. NSF-61 certification.
- 7. Contact NSF International to obtain certification to NSF-61.
 - a. Provide cylinders in sufficient quantity for testing.

2.07 SOURCE QUALITY CONTROL

- A. Contractor shall provide sample and test materials in accordance with the following requirements:
 - 1. Sampling, testing, and reporting frequency:
 - a. In preparation for mix design submittals.
 - b. Whenever there is a change in source of the material, or a significant change in the characteristics or quality of materials from the same source.
 - c. For each 10,000 cubic yards of concrete mix produced.
 - d. At intervals not exceeding 90 calendar days, unless otherwise specified in the following paragraphs.
 - 2. Supplemental cementitious materials.
 - a. Sample and test fly ash in accordance with ASTM C311.
 - b. Sample and test slag cement in accordance with ASTM C989.
 - 3. Aggregate:
 - a. Sample combined aggregate in accordance with ASTM D75 and D3665, and test for gradation in accordance with ASTM C136.
 - b. At least once every 30 days, and when requested by the Engineer.
 - c. Submit test results.
 - 4. Portland cement:
 - a. Sample and test portland cement and provide mill certificates demonstrating compliance with ASTM C150, and additional requirements of this Section.
 - 1) Determine alkali content by method set forth in ASTM C114.
 - b. At least once every 90 days, and when requested by the Engineer.
 - c. Submit test results.
- B. Batch materials in accordance with the following requirements:
 - 1. Concrete batch weights: Control and adjust so as to secure maximum yield, and at all times maintain proportions of concrete mix within specified limits.
 - 2. Aggregates:
 - a. Obtain aggregate from a source capable of providing uniform quality, moisture content, and grading during any single day's operation.
 - b. Furnish satisfactory means at batching plant for checking moisture content of fine aggregate for each batch.
 - 3. Admixtures:
 - a. Batch solutions using mechanical batcher capable of accurate measurement.
 - b. Air entraining admixture: Add to batch in portion of the mixing water, unless otherwise recommended by the admixture manufacturer.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prepare and submit mix designs for each Concrete Class indicated in Table 3 - Concrete Classes.
- B. Submit proposed sequence of concrete placements. After acceptance, adhere to proposed sequence of placing concrete, except when specific changes are requested by the Contractor and accepted by the Engineer.
 - 1. Use construction methods and sequence work to allow concrete placement to reach adequate strength and to be constructed with required support to prevent overstress of the concrete structure during construction.
- C. Make provisions for monitoring weather conditions:
 - 1. Install an outdoor weather station capable of measuring and recording ambient temperature, wind speed, and humidity. Furnish instruments accurate to within 2 degrees Fahrenheit, 5 percent relative humidity, and 1 mile per hour wind speed.
 - 2. Monitor the weather forecast beginning at least 48 hours prior to any concrete placement and make provisions for cold weather concreting or hot weather concreting if those conditions exist or are forecast to exist during the period of placement, finishing, and curing.
 - a. Record temperature, relative humidity, and wind speeds for each placement beginning at least 24 hours before scheduled delivery of concrete.
- D. Place no concrete without Engineer's prior acceptance of conditions.
- E. Notify the Engineer in writing that all preparations are complete and ready for placement of concrete. Such notification shall indicate readiness - not just intention - to place concrete for the designated portion of the Work.
 - 1. Submit notification to Engineer on forms provided by or acceptable to the Engineer and bearing the signature of Contractor's superintendent.
 - a. Sample form is included at the end of this Section, see Attachment B.
 - 2. Submittal of notification will be Contractor's certification that preparations are complete and in accordance with the Contract Drawings and Specifications.
 - 3. Provide notification for Engineer to make final observations at the locations of concrete placements not less than 24 hours before commencing placement of concrete.

3.02 CONCRETE JOINTS

- A. Locations of joints are indicated on the Drawings.
 - 1. In order to preserve strength and watertightness of structures, make no other joints, except as authorized by the Engineer.
 - 2. Construct joints where indicated, and as indicated on the Drawings.
 - 3. Where joint locations are not indicated on the Drawings, submit Contractor's proposed locations for Engineer's review and acceptance. Provide construction joints in slabs and walls at intervals not greater than 35 feet.

- B. Time between placements of adjacent concrete separated by joints.
 - 1. Provide not less than 3 days (72 hours) between placement of adjacent sections for the following:
 - a. Slabs.
 - b. Walls.
 - 2. Provide not less than 7 days (168 hours) between placement of the lower and upper pours for the following:
 - a. Walls over slabs.
 - b. Slabs over walls.
 - c. Slabs keyed into the sides of walls.
- C. Edges of joints:
 - 1. Provide joints have edges detailed as indicated on the Drawings.
 - 2. Protect wall and slab surfaces at edges from concrete splatter. Thoroughly clean adjacent surfaces after completion of each placement.
- D. Joint construction:
 - 1. Preparation of forms:
 - a. Provide cleanout holes at base of each wall and column for inspection and cleaning.
 - b. Wash forms and adjacent joint surfaces of sawdust, chips, and other debris after forms are built, and immediately before concrete or grout placement.
 - c. Should formwork confine sawdust, chips, or other loose matter in such manner that it is impossible to remove them by flushing with water, use a vacuum cleaner for their removal, and then flush cleaned surfaces with water.
 - 2. Before placing concrete against previously placed concrete, thoroughly clean the prior placement of laitance, grease, oil, mud, dirt, curing compounds, mortar droppings, or other objectionable matter by means of pressure washing.
 - 3. Provide and install waterstops, expansion joint material, and other similar materials as indicated on the Drawings and as specified.
 - a. Take special care to ensure that waterstops are secured in proper position.
 - b. Take special care to ensure that concrete is well consolidated around and against waterstops during placement.
 - 4. Horizontal joints:
 - a. As initial placement over cold joints, thoroughly spread bed of cement grout as specified in Section 03600 - Grouting.
 - 1) Thickness: not less than 1/2 inch nor more than 1 inch.
 - b. For wall placements above planned cold joints, placement of cement grout will not be required for locations where the wall mix includes high-range water-reducing admixture ("superplasticizers"), and the Contractor can demonstrate dense concrete joints without voids or honeycomb after the forms are removed.

3.03 MEASURING AND BATCHING MATERIALS

- A. Measurements of materials:
 - 1. Proportion and measure cementitious materials and aggregates by weight.
 - a. Weigh cementitious materials separately.

- b. If bulk cementitious materials are used, weigh them on separate visible scale that will accurately register scale load at any stage of weighing operation from zero to full capacity.
 - c. Cement in unbroken standard packages (sacks) need not be weighed.
 - 2. Mixing water: Measure by volume or by weight.
 - 3. Other mix constituents: Measure by weight, except as otherwise specified or accepted by the Engineer.
 - 4. Weighing and measuring devices:
 - a. Use equipment designed and constructed specifically for that purpose.
 - b. Furnish devices capable of weighing successive quantities of individual material measured to within 1 percent of desired weight of that material.
 - c. Bearing valid seal of the department of weights and measures for the authority having jurisdiction over the Work.
 - 5. Measurements and measuring devices:
 - a. Subject to review by the Engineer.
- B. Batching:
 - 1. Admixtures shall be added at the concrete batch plant.
 - 2. Addition of admixtures in the field is permitted only with prior acceptance by the Engineer, and only when the following conditions are satisfied:
 - a. The dosage and mixing is personally overseen by concrete supplier's trained technologist.
 - b. Adequate mixing is provided after addition.
 - c. The maximum time to placement of concrete remains 90 minutes after water added to mix - not 90 minutes after any field additions/adjustments.
 - d. Slump at discharge after additions/modifications conforms to the requirements of Table 3 - Concrete Classes.

3.04 MIXING AND TRANSPORTING

- A. Machine mixing:
 - 1. Prevent cementitious materials from coming into contact with aggregate or with water until materials are in mixer and ready for complete mixing with all mixing water.
 - 2. Procedure of mixing cementitious materials with sand, or with sand and coarse aggregate, for delivery to project site for final mixing and addition of mixing water is not permitted.
 - 3. Remixing of concrete that has started to take its initial set ("retempering") is not permitted.
 - 4. Discharge entire batch before recharging.
 - 5. Volume of mixed material per batch: Not exceeding manufacturer's rated capacity of mixer.
- B. Transit-mixed concrete:
 - 1. Mix and deliver in accordance with ASTM C94, except as modified in this Section.
 - 2. Total elapsed time between addition of water at batch plant and discharging completed mix:
 - a. Not to exceed 90 minutes nor 300 revolutions of the mixing drum.
 - b. Under conditions contributing to rapid setting, total elapsed time permitted may be reduced by the Engineer.

3. Temperature - minimum and maximum allowable during mixing and transporting:
 - a. Minimum: 50 degrees Fahrenheit.
 - b. Maximum: 90 degrees Fahrenheit.
 4. Continuously revolve drum after it is started until it has completely discharged its batch.
 - a. Do not add water until drum has started revolving.
 - b. Engineer reserves the right to increase required minimum number of revolutions or to decrease designated maximum number of revolutions allowed, if necessary, to obtain satisfactory mixing. Contractor will not be entitled to additional compensation because of such increase or decrease.
- C. Concrete delivery:
1. Furnish to the Engineer a delivery ticket for each batch of ready mixed concrete within 24 hours after delivery. Include the following information on each ticket:
 - a. Time of day concrete was batched, and time of day that discharge from the truck is complete.
 - b. Printed record of the individual weight of each of the following constituents in the batch: fine aggregate, coarse aggregate, cement, pozzolan, and water.
 - c. Concrete Class as defined in Table 3 - Concrete Classes.
 - d. Type, brand, and quantity of each admixture in the batch.
 - e. Total volume of water allowed in the mix, volume of mixing water added at the batch plant, volume of mixing water withheld from the mix during batching, and total volume of any water added to the mix after leaving the batch plant.
 - 1) In no case shall volume of mixing water withheld result in a water/cementitious materials ratio less than the minimum values specified in Table 3 – Concrete Classes.
 - f. Number of revolutions of transit truck at arrival on site, and total number of revolutions when discharge is complete.
 - g. Volume of concrete delivered in the batch.
 - h. Numerical sequence of the batch delivered for that placement.
 2. Additional water may only be added to the mix when the following conditions are fully satisfied:
 - a. Batch ticket showing total volume of water already added and maximum volume of water that may be added is available for Engineer's observation before any additional water is added.
 - b. Total volume of water in the mix after the addition will be less than the maximum allowable volume of water indicated on the ticket.
 - c. The full concrete load is still within the truck's mixing drum, and truck has not begun to discharge the load. Under no conditions shall water be added in the field to a partial truckload of concrete.
 - d. Volume of water added, and time of addition are clearly marked for record on the batch ticket delivered to the Engineer.
 3. Addition of admixtures in the field is permitted only with prior approval by the Engineer, and when the following conditions are satisfied:
 - a. Dosage and mixing is personally overseen by concrete supplier's trained technologist and admixtures supplier's representative.
 - b. Adequate mixing time is provided after addition of admixtures.

- c. The maximum time to placement of concrete remains 90 minutes after water is added to the mix – not 90 minutes after any field additions/adjustments.
- d. Slump at discharge after additions/modifications conforms to the requirements of Table 3 – Concrete Classes.

D. Conveying concrete:

- 1. Convey concrete from mixer to location of final deposit by methods that prevent separation or loss of materials.
- 2. Use equipment for chutes, pumps, and conveying of concrete of such size and design as to ensure practically continuous flow of concrete, from delivery to the point of placement, without separation of materials.
- 3. Design and use chutes and devices for conveying and depositing concrete that direct concrete vertically downward when discharged from chute or conveying device.
- 4. Keep equipment for conveying concrete thoroughly clean by washing and scraping upon completion of any day's placement.

3.05 PLACING AND CONSOLIDATING

A. Preparation:

- 1. Obtain Engineer's acceptance of completed preparations before placing concrete.
 - a. Notify Engineer in writing that all preparations are complete and ready for placement of concrete. Such indication shall indicate readiness, not just intention, to place concrete for the designated portion of the work.
- 2. Confirm completeness of the following before notification of readiness is given to Engineer:
 - a. Place forms, reinforcement, screeds, anchors, ties, and inserts in final position.
 - b. Reinforcement is secure and properly fastened in its correct position.
 - c. Loose form ties at construction joints have been retightened.
 - d. Dowels, bucks, sleeves, hangers, pipes, conduits, anchor bolts, and any other fixtures required to be embedded in concrete have been placed and adequately anchored.
 - e. Forms have been cleaned of debris and form release agents are applied as specified.
- 3. Preparation for placement of footings and slabs on grade:
 - a. Do not place concrete on ground or compacted fill until subgrade is in moist condition acceptable to the Engineer.
 - b. If necessary, sprinkle subgrade with water not less than 6 or more than 20 hours in advance of placing concrete.
 - c. If subgrade surface becomes dry prior to actual placing of concrete, sprinkle again, without forming pools of water.
 - d. Do not place concrete if subgrade is muddy or soft.
- 4. Keep sufficient protective coverings on hand at all times for protection of concrete during and after placement.
 - a. Protect concrete placed before rain to prevent water from coming in contact with such concrete.
 - b. Protect concrete placed before winds to prevent excessive drying or embedment of debris in the finished surfaces.

B. Concrete placement:

1. Do not place concrete:
 - a. With slump outside the limits specified in Table 3, Concrete Classes.
 - b. In which initial set has occurred, or that has been retempered.
 - c. During rainstorms or high velocity winds.
2. Deposit concrete at or near its final position to avoid segregation caused by rehandling or flowing.
 - a. Do not deposit concrete in large quantities in one place, and then work material along forms with vibrator or by other methods.
3. Do not drop concrete freely into place from height greater than 5 feet. Use tremies for placing concrete where drop is over 5 feet.
4. Place concrete on slopes starting from bottom of slope and working upward.
5. Place concrete in horizontal lifts not exceeding 24 inches in depth and bring up evenly in all parts of forms.
6. After concrete placement begins, continue in a continuous operation without significant interruption until the end of the placement. Plan and implement precautions to prevent any delay, between layers or adjacent volumes, from exceeding 20 minutes.
7. If concrete is to be placed over previously placed concrete and more than 20 minutes has elapsed, spread layer of cement grout over surface before placing additional concrete. Provide grout layer thickness of not less than 1/2 inch, nor more than 1 inch.
8. Placement of concrete for slabs, beams, or walkways:
 - a. If cast monolithically over walls or columns, do not commence until concrete in walls or columns has been allowed to set and shrink.
 - b. Allow set time of not less than 1 hour for shrinkage.
 - 1) During waiting time, keep top surface of concrete moist, but not wet.
 - 2) Do not permit water to pond or stand on the surface.
 - 3) Do not coat surface with evaporation retarders or curing agents.
 - c. Start placement above wall or column with layer of cement grout as described in the preceding paragraph.

C. Consolidating concrete:

1. Consolidate concrete with aid of acceptable mechanical vibrators.
2. Thoroughly consolidate concrete around reinforcement, pipes, or other shapes built into the work.
3. Provide sufficiently intense vibration to cause concrete to flow and settle readily into place and to visibly affect concrete over radius of at least 18 inches.
4. Vibrators:
 - a. Keep sufficient vibrators on hand at all times to vibrate concrete as placed.
 - b. In addition to vibrators in actual use while concrete is being placed, have on hand a minimum of 1 spare vibrator in operable condition.
 - c. Do not place concrete until it has been confirmed that all vibrating equipment, including spares, are in operable condition.
5. Place concrete solidly against forms and concrete surfaces, leaving no voids or honeycomb.
6. Make concrete solid, compact, and smooth. If for any reason surfaces or interiors have voids or are in any way defective, repair such concrete in manner acceptable to the Engineer.
7. Do not over-vibrate so as to produce segregation.

3.06 FINISHING CONCRETE

- A. Provide concrete finishes in accordance with Section 03366 - Tooled Concrete Finishing unless otherwise indicated on the Drawings.
- B. Liquid evaporation retardant:
 - 1. Under conditions that result in rapid evaporation of moisture from the surface of the concrete, coat the surface of the concrete with a liquid evaporation retardant immediately after screeding.
 - 2. Conditions that result in rapid evaporation of moisture are defined as any combination of ambient temperature, concrete temperature, relative humidity, wind speed, and solar radiation intensity that creates conditions that will evaporate water from a free concrete surface at a rate equal to or greater than 0.1 pounds per square foot per hour as determined by the Menzel Formula and monograph published in ACI 305R, and included as Attachment A to this Section.
 - 3. Apply evaporation retardant again after each finishing operation as necessary to prevent drying shrinkage cracks.
 - 4. Do not work evaporation retardant into the surface of the concrete.
 - 5. Do not use evaporation retardant as finishing aid (to rehydrate surface a creamy state for finishing).
 - 6. Concrete surfaces in direct contact with potable water in the finished work:
 - a. After curing is complete, pressure wash concrete, using equipment and procedures acceptable to the Engineer, to remove residual evaporation retardant and other compounds prior to cleaning structure for disinfection.
- C. Concrete sealer:
 - 1. Floors and slabs to receive concrete sealer: See Room Finish Schedule on the Drawings, and Section 03366 - Tooled Concrete Finishing.

3.07 CURING

- A. Cure concrete by methods specified in this Section.
- B. Keep concrete continuously moist and at an average daily temperature of at least 50 degrees Fahrenheit for a minimum of 7 days after placement.
 - 1. Provide at least 350 degree days of curing (350 degrees times 7 days of 24 hours each).
 - 2. If hourly temperatures at any surface of a concrete placement drop below 50 degrees Fahrenheit during the curing period, count the period below 50 degrees Fahrenheit as zero degrees, and extend the curing time to compensate.
- C. Schedule of curing methods:
 - 1. Cure the following concrete surfaces using water curing, or plastic membrane curing.
 - a. Floor surfaces of water containment structures.
 - b. Surfaces where additional concrete will be placed over or against the surface, including concrete joints.
 - c. Surfaces where grout or other toppings will be placed over the surface.
 - d. Slabs scheduled to receive concrete sealer, or other bonded or adhered architectural finishes.

- e. Formed surfaces scheduled to receive coatings, paint, adhered masonry, cementitious materials, or other similar finishes, and where formwork is removed within 7 days after concrete placement.
 - f. Horizontal concrete surfaces at tops of walls.
 - 2. Cure the following concrete surfaces by water curing, plastic membrane curing, or sprayed curing membrane. Selection of methods shall be at the Contractor's option.
 - a. Surfaces not listed in the preceding paragraph.
- D. Water curing:
- 1. Keep surfaces of concrete constantly and visibly wet, day and night, for period of not less than 7 days.
 - a. Each day forms remain in place will be counted as 1 day of water curing.
 - b. Do not loosen form ties during period when concrete is cured by leaving forms in place. No further curing credit will be allowed for forms remaining in place after contact has been broken between concrete surface and forms.
 - 2. Begin water curing as soon as concrete attains initial set.
 - 3. Maintain a wet surface by ponding, continuous sprinkling, covering with saturated burlap, or otherwise saturating the surface by means acceptable to Engineer.
 - a. Flood top of walls with water at least 3 times per day and keep surfaces moist at all times during 7 day curing period.
 - b. Provide plastic sheet material over surfaces if required to maintain a wet surface during arid or windy conditions. See plastic membrane curing requirements for additional details.
 - 4. Use water having a temperature within 20 degrees Fahrenheit of the temperature of concrete, and not lower than the minimum temperature allowed for the concrete surface during curing.
- E. Plastic membrane curing:
- 1. Install plastic membrane as soon as concrete is finished and can support limited pedestrian traffic without damage.
 - 2. Cover entire surface of finished concrete with membrane.
 - 3. Anchor membrane to prevent uplift from wind or air trapped below the sheet.
 - 4. Fully seal joints and edges to provide full seal around perimeter.
 - 5. Keep concrete under plastic membrane moist, regularly monitoring surfaces and adding supplemental moisture if necessary. Add water as specified for water curing.
- F. Sprayed membrane curing compound:
- 1. Apply curing compound to concrete surface after repairing and patching, and within 1 hour after forms are removed.
 - a. If more than 1 hour elapses after removal of forms, do not use membrane curing compound. Instead, provide water curing for not less than 7 days.
 - b. Do not remove sprayed membrane curing compound from concrete in less than 7 days after initial application.
 - c. When application of curing compound at concrete joints is accepted by Engineer, take care to apply curing compound to all surfaces along full profile of joints.

2. Apply curing compound by mechanical, power operated sprayer with mechanical agitator that will uniformly mix all pigment and compound.
 - a. Apply curing compound in at least 2 coats.
 - b. Apply each coat in direction turned 90 degrees from application direction of the preceding coat.
 - c. Apply curing compound in sufficient quantity so that concrete has uniform appearance and its natural color is effectively and completely concealed at time of spraying.
 - d. Continue to coat and recoat surfaces until specified coverage is achieved and until coating film remains on concrete surfaces.
3. Thickness and coverage of curing compound:
 - a. Provide curing compound having film thickness that can be scraped from surfaces at any and all points after drying for at least 24 hours.
 - b. Contractor is cautioned that method of applying curing compound specified in this Section may require more curing compound than normally suggested by manufacturer of curing compound and is more than is customary in the trade. Apply amounts specified in this Section, regardless of manufacturer's recommendations or customary practice.
4. If Contractor desires to use a curing compound other than specified product, coat sample areas of concrete wall with proposed curing compound, and also coat similar adjacent area with the specified compound in the manner specified, for comparison:
 - a. If proposed sample is not equal or better, in opinion of the Engineer, the proposed substitution will not be allowed.
5. Removal of curing compound.
 - a. After curing period is complete, remove curing compound placed on surfaces that will receive additional concrete, including all concrete joint surfaces, by heavy sandblasting or by other means acceptable to Engineer. Complete removal and cleanup prior to placing any new concrete against the surface.
 - b. Where additional finishes will be applied over concrete surfaces, unless otherwise recommended by the manufacturer of the finish to be applied, remove curing compound by sandblasting. Provide blasting as necessary to fully remove curing compound.
6. Prior to final acceptance of the work, remove, by sandblasting or by other method acceptable to the Engineer, any curing compound on surfaces exposed to process water or exposed to view, so that only natural color of finished concrete is visible and uniform over the entire surface.

3.08 PROTECTION

- A. General:
 1. Keep forms in place, as specified in the following paragraphs, to provide curing and to protect concrete surfaces and edges from damage.
 2. Immediately after forms are removed, carefully examine concrete surfaces, and repair any irregularities in surfaces and finishes as specified.

- B. Form removal:
1. Do not remove forms from concrete which has been placed when outside ambient air temperature is below 50 degrees Fahrenheit until the following conditions are satisfied:
 - a. Concrete has sufficient strength to allow form removal without damage to surfaces.
 - b. At least 48 hours have elapsed since the end of concrete placement.
 - c. Provisions are in place to maintain moisture for curing concrete, and temperature at or above the required minimum curing temperature specified.
 2. Vertical forms:
 - a. Retain in place for a minimum of 24 hours after concrete is placed.
 - b. If concrete has sufficient strength and hardness to resist surface or other damage after 24 hours, forms may be removed.
 3. Other forms supporting concrete, and shoring: Retain in place as follows:
 - a. Formed sides of footings: 24 hours minimum.
 - b. Formed vertical sides of beams, girders, and similar members: 48 hours minimum.
 - c. Forms below slabs, beams, and girders: Until concrete strength reaches specified strength f'_c or until shoring is installed.
 - 1) Shoring for slabs, beams, and girders: Shore until concrete strength reaches minimum specified 28-day compressive strength.
 4. Wall bracing: Brace walls until strength of concrete beams and slabs laterally supporting wall reaches minimum specified 28-day compressive strength.
- C. Loading of concrete members:
1. Placement of loads on or against green concrete is not permitted.
 2. Do not place soil against walls, or fill over the top of concrete until conditions designated in the following paragraphs are satisfied:
 - a. Walls have been cast to their full height in the structure and have achieved their minimum specified 28-day compressive strength.
 - b. Connecting slabs and beams that brace the walls are in place, are complete, and (in the case of concrete) have achieved their minimum specified 28-day compressive strength.

3.09 COLD WEATHER CONCRETING

- A. Implement cold weather concreting procedures during periods of cold weather as defined in this Section.
1. Comply with the recommendations of ACI 306R and this Section.
- B. Prepare a cold weather concreting plan. Maintain at least 1 copy of the plan on site. Provide plan for review if requested by the Engineer.
1. Include procedures for batching, delivery, placement, curing, protection, and for monitoring and recording the temperature of the concrete and the surrounding environment.
 2. Describe procedure to be implemented in the event of abrupt changes in weather conditions or of equipment failure.
 3. Review cold weather concreting plan during pre-construction meeting. Make provisions to address any concerns expressed by Engineer before beginning concrete placements.

- C. Preparation:
1. Do not place concrete over frozen subgrade materials. Provide insulating material and supplementary heat if required to maintain a thawed surface.
 2. Do not place concrete around metallic elements whose temperature is less than 40 degrees Fahrenheit. If heating is required, use processes that do not alter the metallurgical properties of the elements.
 3. Remove snow, ice, and frost from reinforcement, embedments and forms. Schedule such removal immediately before concrete placement so that surfaces do not refreeze.
- D. Batching, delivery, placement and finishing:
1. Accelerating admixtures will not be permitted.
 2. Based on temperature of the environment and the surfaces where concrete will be placed, select and maintain mix temperature as recommended in ACI 306R.
 - a. Make provisions for temperature loss during delivery and placing.
 - b. Place concrete at or slightly above the minimum recommended batch temperatures. Do not exceed these minimum values by more than 20 degrees Fahrenheit.
 3. Heating: If temperature of water or aggregates is below 35 degrees Fahrenheit, heat the materials.
 - a. Mixing water: Do not heat above 140 degrees Fahrenheit.
 - b. Aggregates:
 - 1) Heat uniformly to eliminate ice, snow, and frozen lumps of material.
 - 2) Avoid overheating.
 - 3) Do not exceed average temperature of 140 degrees Fahrenheit or spot temperature of 200 degrees Fahrenheit.
- E. Protection and curing:
1. Protect concrete to provide continuous warm moist curing immediately after placement and during protection period.
 2. Minimum protection period: 7 days.
 3. During and immediately after the protection period, maintain temperature in accordance with Table 5 of this Section. Provide record of temperature during placement and curing as specified in the following paragraphs.
 - a. Furnish and locate maximum/minimum temperature recording thermometers in sufficient numbers to confirm concrete.

Table 5 - Concrete Temperatures - Normal Weight Concrete			
Section Thickness (inches)	<12	12 to <36	36 to <72
During Protection Period: As maintained (minimum).	55 degrees Fahrenheit	50 degrees Fahrenheit	45 degrees Fahrenheit
After Protection Period: Gradual drop during first 24 hours (maximum).	50 degrees Fahrenheit	40 degrees Fahrenheit	35 degrees Fahrenheit

4. Provide plastic sheeting, polystyrene foam sheets, insulating blankets, and supplemental heating if required to maintain moisture and the specified temperatures during protection.
 - a. Protect insulating blankets from moisture in the concrete and from rain or snow using impermeable sheeting.

- b. Supplemental heating units:
 - 1) Vent units to outside atmosphere. Do not exhaust heater flue gasses into the enclosed and protected area.
 - 2) Make provisions to heat the flow freely within protected area, and to maintain a uniform temperature throughout the space.
 - 3) Locate units to avoid local drying or uneven heating of concrete surfaces.
 - c. Pay particular attention to maintaining required temperature and moisture at edges and corners.
 - 5. At the end of the protection period, allow concrete to cool gradually to the ambient temperature.
 - a. Maximum temperature drop over the first 24-hour period shall be as specified above.
 - b. Where temperature of concrete exceeds ambient by 20 degrees Fahrenheit or more, loosen forms and leave in place for at least 24 hours before removal.
 - c. If water curing has been used, maintain concrete temperature as specified in the following paragraphs for at least 24 hours after water curing is terminated. Allow water-cured concrete to air dry for at least 3 days before exposure to freezing temperatures.
- F. Temperature records:
- 1. For each area of concrete placed or cured during cold weather, record the temperature of concrete and the ambient environment.
 - a. Maintain temperature records on site and make records available for review by the Engineer upon request.
 - b. Deliver a final copy of each record to Engineer for project files not more than 14 calendar days after the date concrete was placed.
 - 2. Concrete delivered for placement.
 - a. Measure and record temperature at the point of discharge in accordance with ASTM C1064.
 - b. Note temperature on the batch ticket.
 - 3. Concrete during the protection period:
 - a. Furnish and locate self-recording thermometers (maximum/minimum) around each placement. Number and location of thermometers shall be sufficient to represent temperatures around the entire concrete placement.
 - b. Position thermometers to record the temperature at each edge or corner and at the middle of the placement area.
 - 4. Include in the temperature record of each placement the following information, recorded legibly on a single sheet.
 - 5. In the event that evaluations of the efficacy of concrete protection and curing are required, the lowest temperature recorded in any placement during each 24 hour period will be assumed to be the temperature at which the entire placement was maintained. Protection periods with any temperature records will be assumed to have provided no protection or curing, and the protection period will be extended by 2 days for each day without protection.

3.10 HOT WEATHER CONCRETING

- A. Implement hot weather concrete procedures during periods of hot weather as defined in this Section.
 - 1. Comply with the recommendations of ACI 305R and this Section.

- B. If placements during hot weather are expected, and when requested by the Engineer, prepare a hot weather concreting plan. Maintain at least 1 copy on site. Provide plan for review if requested by the Engineer.
1. Include procedures for batching, delivery, placement, curing, protection, and monitoring and recording the temperature of the concrete and the surrounding environment.
 2. Describe procedures to be implemented in the event of abrupt changes in weather conditions, or in the event of equipment failure.
 3. Review hot weather concreting plan during pre-construction meeting. Make provisions to address any concerns expressed by Engineer before beginning concrete placements.
- C. Preparation:
1. Do not place concrete against forms, reinforcement, or embedments with a surface temperature greater than 120 degrees Fahrenheit.
 - a. If necessary, to maintain maximum concrete temperature during placing, cool forms and reinforcement to temperature below 90 degrees Fahrenheit using water or shades.
 - b. Do not allow water to puddle in forms or placement areas.
 2. Moisten forms or subgrade to maintain a saturated surface without standing water or soft spots.
 3. Provide windbreaks, shades, fog spray, sprinkling, wet cover, or other means required to protect concrete from premature loss of moisture and rapid temperature gain.
- D. Batching and delivery:
1. Retarding admixtures will not be permitted.
 2. Temperature of concrete delivered for placement shall not exceed 90 degrees Fahrenheit.
 - a. Maintain uniform temperature in the mix below this level during batching, delivery, placing, and consolidation.
 - b. Temperature of mix, even if below the maximum allowable temperature specified, shall be maintained at a level to avoid loss of slump, flash setting, or cold joints in placements.
 3. If necessary:
 - a. Mix water may be chilled or replaced with ice to maintain mix temperature. Where mix water is replaced with ice, provide replacement at a 1 to 1 ratio by weight.
 - b. Shade transit mixed concrete trucks, or cool mixing outside of container with water to control temperature of concrete.
- E. Placing and finishing:
1. Place and finish concrete promptly. Place so that vertical lift lines will not be visible in exposed concrete surfaces.
 2. Provide plastic sheeting, fog nozzles, shades or other means to reduce concrete temperature and protect from moisture loss.
- F. Protection and curing:
1. Furnish and locate maximum/minimum temperature recording thermometers in sufficient numbers to confirm concrete temperatures over full area and edges of concrete.

2. Flatwork: Protect and cure using water curing methods as specified in this Section.
 - a. Water curing:
 - 1) Keep concrete continuously wet and make provisions for runoff.
 - 2) For sprinkling or soaker hoses, maintain temperature of water as close as possible to the temperature of the concrete to minimize effects of thermal shock.
3. Formed surfaces: Protect and cure using forms left in place or membrane curing methods as specified in this Section.
 - a. Cover forms and keep continuously moist for at least 24 hours after placement.
 - b. Loosen forms as soon as this can be accomplished without damaging the concrete.
 - c. Maintain continuously moist surfaces by fogging or spraying with water, or by application of curing compound as specified.

3.11 FIELD QUALITY CONTROL

- A. Provide quality control over the Work of this Section as required by Section 01450 - Quality Control.
- B. Field tests:
 1. Construction Manager shall provide and pay for field testing.
 2. During progress of construction, provide testing to determine whether the concrete, as being produced, complies with requirements specified.
 3. See Section 01455 - Regulatory Quality Assurance - Special Tests and Inspections for requirements.
 - a. Cooperate in testing by allowing free access to the Work for testing laboratory to sample and test materials.
 - b. Contractor is responsible for providing care of and curing conditions for test specimens in accordance with ASTM C31 until specimens are collected by testing laboratory.
 - c. Contractor shall provide 4 firmly braced, insulated, heated, closed wooden curing boxes, each sized to hold 10 specimens. Include cold weather temperature and hot weather temperature control thermostat for initial curing and storage from time of fabrication through shipment to Owner's testing laboratory.
 4. Testing shall include:
 - a. Sampling of concrete in accordance with ASTM C172.
 - b. Temperature of concrete at delivery in accordance with the requirements of ASTM C1064 and as specified in this Section.
 - c. Slump of concrete using slump cone in accordance with requirements of ASTM C143. Test slump at the following intervals:
 - 1) At the beginning of each placement.
 - 2) As often as necessary to keep slump within the specified range, but not less than every 6th truck.
 - 3) When requested to do so by the Engineer.
 - 4) Observe concrete during slump test for signs of segregation.
 - a) Observe concrete to see if mortar or moisture flows from slumped concrete.
 - b) Reject concrete if mortar or moisture flows out of mix.
 - d. Unit weight of concrete in accordance with ASTM C138.

- e. Air entrainment in accordance with ASTM C173. Test air content at the following intervals:
 - 1) At beginning of each placement.
 - 2) As often as necessary to keep entrained air within specified range, but not less than every 6th truck.
 - 3) When requested to do so by the Engineer.
 - 4) Test air entrainment in concrete in accordance with ASTM C173. If air entraining admixtures used for the Work require alternate testing procedures, advise the independent testing laboratory well in advance of the dates of testing, and confirm that appropriate equipment and personnel are provided for the test.
 - 5) Make air test at point of delivery (discharge from mixer). For pumped concrete, make air tests at point of delivery and at point where expelled after pumping for placement.
- f. Compressive strength in accordance with ASTM C39. Required number of cylinders is as follows:
 - 1) Not less than 6 cylinder specimens, 4 inches in diameter by 8 inches long, will be tested for each 150 cubic yards of each class of concrete, with minimum of 6 specimens for each class of concrete placed; not less than 6 specimens for each half day's placement; and not less than 2 sets of 6 specimens for each structure.
 - 2) 1 cylinder will be broken at 7 days, 1 at 14 days, and 3 at 28 days. The 6th cylinder may be used to evaluate strength after 28 days if requested by the Engineer.
 - 3) Retain and store "6th cylinders" (tested and untested) at testing laboratory until 56 days. Break "6th cylinder" when directed by the Engineer.
- g. Provide full access for Engineer to observe concrete sampling and testing at any time.
- h. Air entrainment in accordance with ASTM C173. Test air content at the following intervals:
 - 1) At beginning of each placement.
 - 2) As often as necessary to keep entrained air within specified range, but not less than every 6th truck.
 - 3) When requested to do so by the Engineer.
 - 4) Test air entrainment in concrete in accordance with ASTM C173. If air entraining admixtures used for the Work require alternate testing procedures, advise the independent testing laboratory well in advance of the dates of testing, and confirm that appropriate equipment and personnel are provided for the test.
 - 5) Make air test at point of delivery (discharge from mixer). For pumped concrete, make air tests at point of delivery and at point where expelled after pumping for placement.
- i. Compressive strength in accordance with ASTM C39. Required number of cylinders is as follows:
 - 1) Not less than 6 cylinder specimens, 4 inches in diameter by 8 inches long, will be tested for each 150 cubic yards of each class of concrete, with minimum of 6 specimens for each class of concrete placed; not less than 6 specimens for each half day's placement; and not less than 2 sets of 6 specimens for each structure.

- 2) 1 cylinder will be broken at 7 days, 1 at 14 days, and 3 at 28 days. The 6th cylinder may be used to evaluate strength after 28 days if requested by the Engineer.
 - 3) Retain and store "6th cylinders" (tested and untested) at testing laboratory until 56 days. Break "6th cylinder" when directed by the Engineer.
 - j. Provide full access for Engineer to observe concrete sampling and testing at any time.
- C. Test completed liquid containment structures listed in Section 01759 - Water Leakage Test for Concrete Structures for watertightness.
- D. Construction Manager shall provide on-site inspection and field quality assurance for the Work of this Section as specified in Section 01450 - Quality Control.
 - 1. Special tests and inspections: See Section 01455 - Regulatory Quality Assurance.
 - 2. Field inspections:
 - a. Required inspections:
 - 1) Observe construction for conformance to the Contract Documents and the accepted submittals.
 - b. Records of inspections:
 - 1) Provide record of each inspection.
 - 2) Submit copies to Contractor's Engineer upon request.
 - 3. Field tests:
 - a. Construction Manager may request, at any time, additional testing to confirm that materials being delivered and placed conform to the requirements of the Contract Documents.
 - 1) If such additional testing shows that the material do not conform to the specified requirements, Contractor shall pay the cost of these tests.
 - 2) If such additional testing shows that the materials do conform to the specified requirements, Owner's Project Representative will pay the cost of these tests.

3.12 NON-CONFORMING WORK

- A. Remove and replace or repair non-conforming and defective work.
 - 1. Provide repairs having strength equal to or greater than specified concrete for areas involved.
 - 2. Provide replacement or repair of non-conforming work by means acceptable to the Engineer and at no additional cost to Owner.
 - 3. Project schedule will not be extended based on work to address non-conforming concrete.
- B. Concrete not conforming to the specified requirements for properties of plastic concrete: Remove from the site and replace with conforming materials at no additional cost to Owner.
 - 1. Temperature: Do not use concrete having a temperature above or below the limits specified in this Section.

2. Slump: Do not place concrete that does not conform to requirements for slump.
 3. Air entrainment: Do not use concrete that does not conform to requirements for percentage of entrained air.
- C. Concrete not conforming to the specified requirements for compressive strength:
1. Concrete is expected to reach a compressive strength equal to or greater than the minimum specified compressive strength f'_c in Table 3, Concrete Classes.
 2. Strength of concrete will be considered acceptable if following conditions are satisfied.
 - a. Averages of all sets of 3 consecutive strength test results is greater than or equal to the specified compressive strength f'_c .
 - b. No individual strength test (average of 2 cylinders) falls below specified compressive strength f'_c by more than 500 pounds per square inch.
 - c. Where relationships between 7-day and 28-day compressive strength, or between 28-day and 56-day compressive strength, have been provided as part of the mix design submittals:
 - 1) 7-day strength may be considered as an indication of 28 day strength provided effects of temperature and humidity between 7 day and 28 day are taken into account.
 - 2) 28-day strength may be considered as indication of 56 day strength provided effects of temperature and humidity between 28 days and 56 days are taken into account.
 3. Non-compliant strength tests.
 - a. Mark non-compliant strength test reports to highlight the non-complying results, and immediately forward copies to all parties on the test report distribution list.
 - b. Initial treatment may consist of additional curing of affected portion followed by not less than 3 cores at each affected area, taken in accordance with ASTM C42 and ACI 318. Obtain Engineer's acceptance of proposed coring locations before proceeding with that work.
 - c. Submit report of compressive strength testing for Engineer's review.
 - d. If requested by the Engineer, provide additional cores and obtain petrographic testing in accordance with ASTM C856. Submit results for Engineer's review.
 - e. If additional curing does not bring average of 3 cores taken in affected area to at least specified compressive strength f'_c , designate such concrete in affected area will be considered defective.
 - f. Engineer may require the Contractor to strengthen defective concrete by means of additional concrete, additional reinforcing steel, or replacement of defective concrete, all of the Contractor's expense.
- D. Concrete sections or surfaces with honeycombing and voids:
1. Provide repairs having surface appearance and finish consistent with that of the surrounding work and acceptable to the Engineer.
 2. Do not patch, repair, or cover defective Work without prior inspection by the Engineer.
 3. Preparation of concrete for repair:
 - a. Make no repair until Engineer has accepted methods for preparing surfaces and for making and curing repairs.

- b. Chip out and key-in imperfections in the Work to make them ready for repair.
- c. Coat bonding surfaces and edges of repair area with one of the following bonding agents as accepted by the Engineer.
 - 1) Epoxy bonding agent as specified in Section 03071 – Epoxies.
 - 2) Epoxy resin/portland cement bonding agent as specified in Section 03072 - Epoxy Resin/Portland Cement Bonding Agent.
- 4. Methods of repair:
 - a. Dry pack mortar method:
 - 1) Use for holes having depth nearly equal to or greater than least surface dimension of hole, for cone-bolt holes, and for narrow slots cut for repair.
 - 2) Smooth Holes: Clean and roughen by heavy sandblasting before repair.
 - 3) Install dry-pack mortar as specified in Section 03600 - Grouting.
 - b. Cement mortar method:
 - 1) Use for holes too wide to dry pack and too shallow for concrete replacement; and for comparatively shallow depressions, large or small, that extend no deeper than nearest surface reinforcement.
 - 2) Install cement mortar as specified in Section 03600 - Grouting.
 - c. Concrete replacement:
 - 1) Use when holes extend entirely through the concrete section or when holes are more than 1 square foot in area and extend halfway or more through the section.
 - 2) Form, place, consolidate, and cure concrete of same mix as the surrounding work.
- E. Leaking construction joints and cracks in concrete walls and slabs:
 - 1. Repair cracks that develop in walls or slabs, and repair cracks that show any signs of leakage until all leakage is stopped.
 - 2. Pressure inject visible cracks in the following areas, other than hairline cracks and crazing, with repair products and methods acceptable to the Engineer.
 - a. Floors and walls of water bearing structures.
 - b. Walls and overhead slabs of passageways and occupied spaces where the opposite face of the member is exposed to weather or may be washed down and where the opposite face does not receive a separate waterproofing membrane.
 - c. Other items not specified to receive separate waterproofing membrane including slabs over water channels, wet wells, reservoirs, and other similar surfaces.
 - 3. Continue pressure injection of cracks as specified until structure is watertight and remains watertight for not less than 1 year after date of Substantial Completion or date of final repair, whichever occurs later in time.
- F. Leaking expansion joints in concrete walls or slabs that include waterstops:
 - 1. Repair any signs of leakage until all leakage is stopped.
 - 2. Pressure inject visible leaks with hydrophilic polyurethane foam resin as specified in Section 03933 - Hydrophilic and Hydrophobic Foam Polyurethane Resin Injection System.
 - 3. Continue pressure injection along joints lines as specified until structure is watertight and remains watertight for not less than 1 year after date of Substantial Completion or date of final repair, whichever occurs later in time.

- G. Walls and slabs at overhead channels that leak or sweat because of porosity or cracks too small for successful pressure injection with epoxy.
 - 1. Seal on water or weather side by coating using surface-applied sealing system as specified in this Section.
 - 2. Apply as recommended by manufacturer published instructions. Where concrete continues to sweat or leak, apply additional coats of surface-applied sealing system until the sweating or leaks stop.
 - 3. Continue application of surface-applied sealing system until structure is watertight and remains watertight for not less than 1 year after date of Substantial Completion, or date of final repair, whichever occurs later in time.

3.13 ATTACHMENTS

- A. Attachment A: Menzel Formula and Monograph.
- B. Attachment B: Coarseness Factor Chart.
- C. Attachment C: Combined Aggregate Gradation Chart.
- D. Attachment D: Contractor's Concrete Placement Checklist Form.

END OF SECTION

ATTACHMENT A

MENZEL FORMULA AND MONOGRAPH

Source: ACI 350R

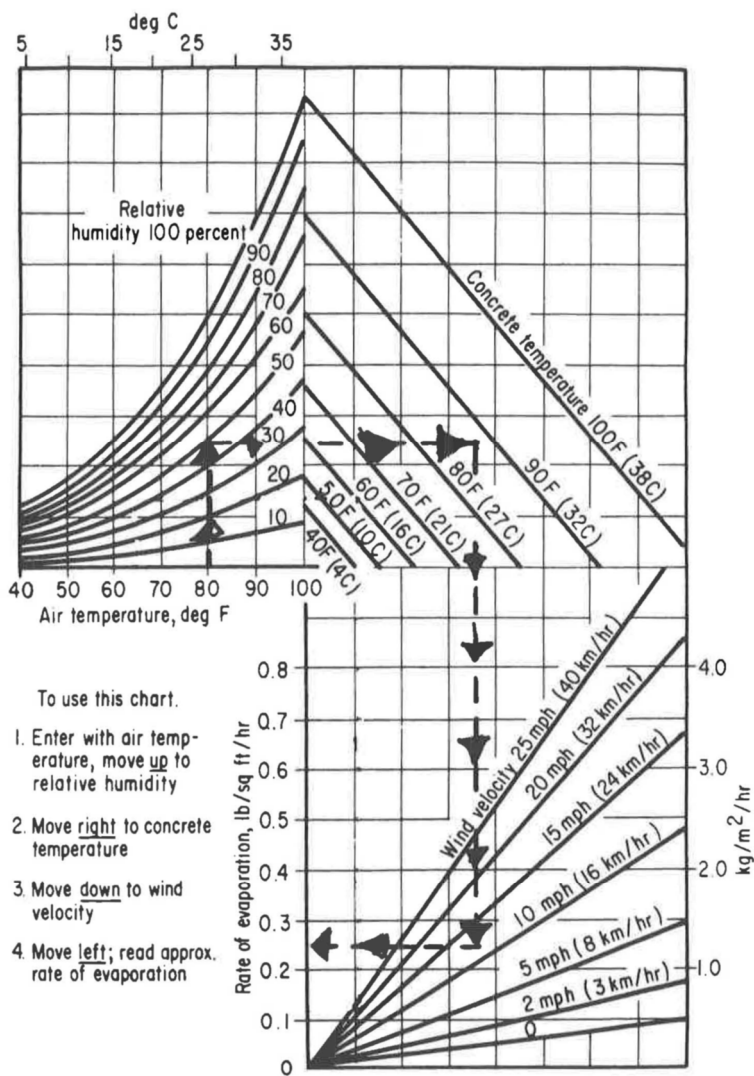


Fig. 2.1.5—Effect of concrete and air temperatures, relative humidity, and wind speed on the rate of evaporation of surface moisture from concrete. This chart provides a graphic method of estimating the loss of surface moisture for various weather conditions. To use this chart, follow the four steps outlined above. If the rate of evaporation approaches 0.2 lb/ft²/h (1 kg/m²/h), precautions against plastic-shrinkage cracking are necessary (Lerch 1957). Wind speed is the average horizontal air or wind speed in mph (km/h) and should be measured at a level approximately 20 in. (510 mm) higher than the evaporating surface. Air temperature and relative humidity should be measured at a level approximately 4 to 6 ft (1.2 to 1.8 m) higher than the evaporating surface on its windward side shielded from the sun's rays (PCA Journal 1957).

ATTACHMENT B

COARSENESS FACTOR CHART

Source: ACI 302.1R-15, Figure 8.9.2.2.

COARSENESS FACTOR CHART

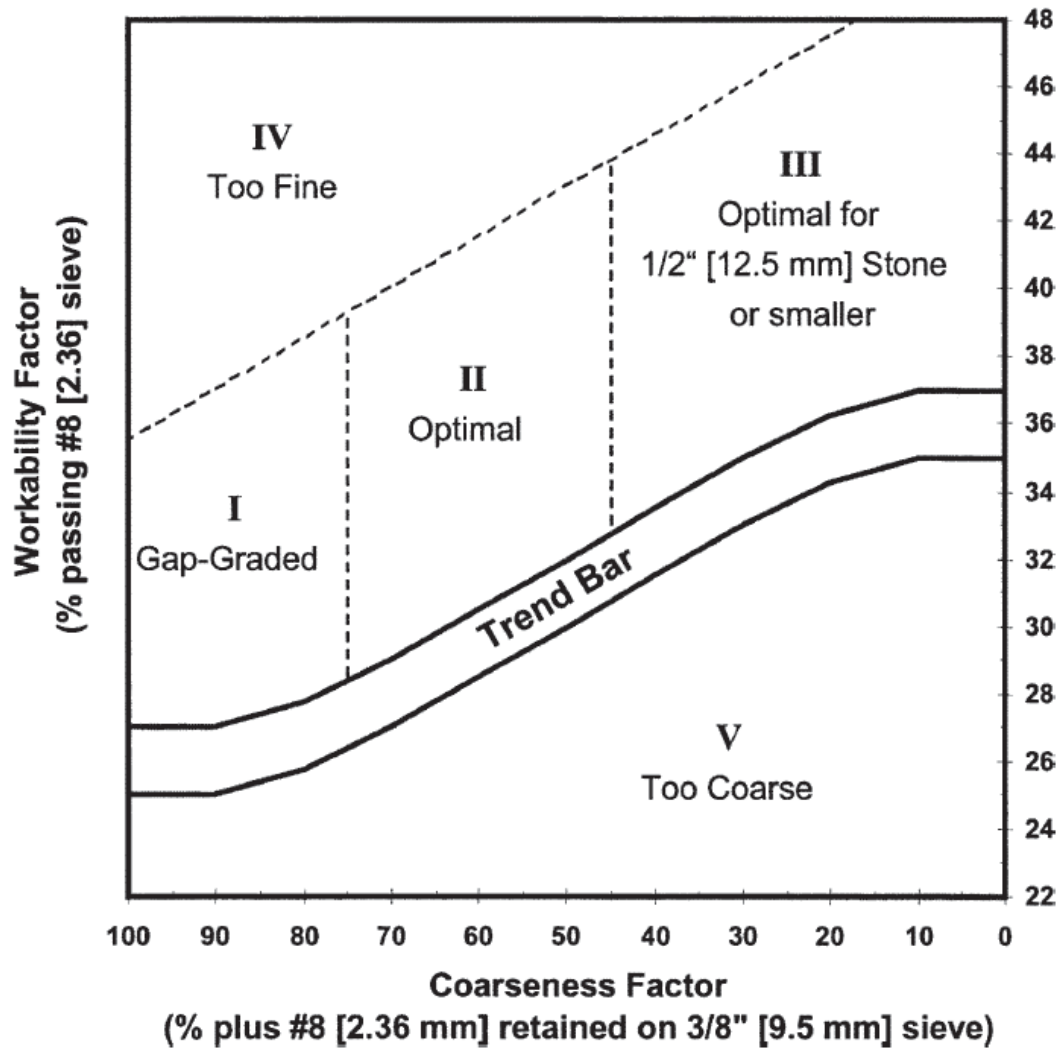
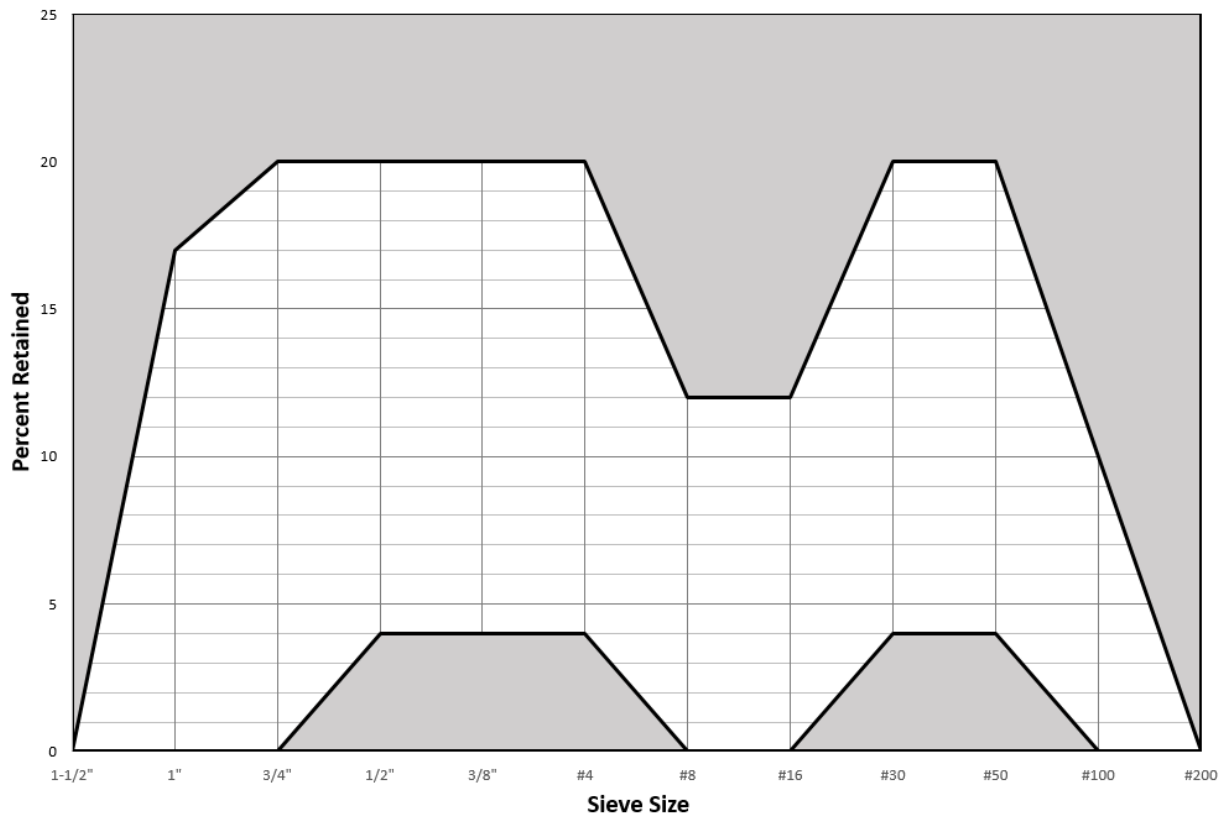


Fig. 8.9.2.2—Coarseness factor chart for evaluating potential performance of mixture.

ATTACHMENT C
COMBINED AGGREGATE GRADATION CHART

Combined Aggregate Gradation Analysis



ATTACHMENT D

CONCRETE PLACEMENT CHECKLIST

Project: _____ Class of Concrete _____

Project No.: _____ Test Cylinders Taken? Yes _____ No _____

Location of Placement _____

Preparation Slab	Contractor	N/A
Compaction Subgrade		
Filter Fabric/Drain Rock-ABC/Separator Fabric		
Drain Rock, Pea Gravel & Void Form		
Reinforcing Steel		
Screeds		

Embedded Items	Contractor	N/A
A. Anchor Bolts		
B. Water Stop		
C. Rebar		
D. Electrical		
E. Plumbing Rough-in		
F. Mechanical		
G. HVAC		

Concrete Placement Equip.	Contractor	N/A
A. Crane		
B. Buckets		
C. Hoppers		
D. Vibrators		
E. Elephant trunks		
F. Floodlights		
G. Pump Truck		

Building Department Notification
Date: _____ Time: _____

Prep Wall Concrete	Contractor	N/A
Access To Work		
Ladders Secured		
Clean up and Washed Out		
Reinforcing Steel		

Forms	Contractor	N/A
A. Alignment & Grade		
B. Scaffolding		
C. Sleeves & Wall Castings		
D. Embedded Items		
E. Electrical		
F. Plumbing Rough-in		
G. Piping		

Record of Curing Conditions During Placement
Start Finish
Date
Time
Weather
Temperature
Comments

The Contractor certifies the above-proposed concrete placement is prepared as indicated and is in accord with the Contract Drawings and Specifications. The Contractor requests permission to begin placement of concrete on the date of _____ at _____. The estimated number of yards is: _____. The estimated duration of the placement is _____.

By: _____
Contractor

Released for placement by: _____
Engineer

AD2 Addendum No. 2
AD3 Addendum No. 3

Cast-in-Place Concrete
03300-51

pw://Carollo/Documents/Client/CA/Turlock/11380B10/Specifications/03300 (AD3)

11380B10
July 9, 2021 - Addendum No. 3

SECTION 08710

DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Door hardware.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - 2. E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- B. Builders Hardware Manufacturers Association (BHMA):
 - 1. A156.7 - Template Hinge Dimensions.
 - 2. A156.18 - Materials and Finishes.
- C. Underwriters Laboratories, Inc.

1.03 SUBMITTALS

- A. Product data.
- B. Hardware schedule: Include references to Engineer's hardware group number, door type designations, locations, other pertinent data, and manufacturer names or suitable abbreviation opposite items scheduled.
- C. Samples: Include for each different type and manufacturer for review of finish.
- D. Construction key distribution list: Submit upon Owner's request.
- E. Templates:
 - 1. Furnish hardware templates to fabricators of doors, frames, and other work to be factory-prepared for hardware.
 - 2. Check shop drawings of other work to confirm that adequate hardware backing is available.
- F. Project record documents: Include corrected hardware schedule.

1.04 REGULATORY REQUIREMENTS

- A. Provide State Fire Marshall approved fire-rated cross-corridor assemblies and panic devices.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hardware where directed in unopened packages with items packed separately, complete and ready for installation with necessary fittings, trim, fasteners, and accessories.
- B. Provide packages bearing the manufacturers' labels with each item or group of items identified according to the accepted hardware schedule.

1.06 MAINTENANCE

- A. Require lockset manufacturers to deliver permanent removable cylinder cores and keys and minimum 2 extractor keys to Owner directly.

1.07 SCHEDULING AND SEQUENCING

- A. Upon receipt of accepted hardware schedule, coordinate accepted hardware schedule, templates, reinforcing units, and template instructions to door and frame sections.
- B. Restrict distribution of construction keys to superintendents and foremen. Maintain record of persons who have received keys on construction distribution list.

PART 2 PRODUCTS

2.01 FASTENERS

- A. Types:
 - 1. To concrete, marble, or masonry: Machine screws and flush shells.
 - 2. To wood: Wood screws.
 - 3. On gypsum board or plaster: Screws of sufficient length to provide solid connection to framing or backing behind gypsum board or plaster.
 - 4. To mineral and hollow core doors: Hex bolts.
 - 5. Of exit devices to doors: Thru-bolts, unless otherwise specified.
- B. Screws, exposed: Phillips-head type, full-threaded screws, not combination type.
- C. Sizes: Suitable for heavy use.
- D. Finish: Stainless steel, unless otherwise required to match material and hardware finish.

2.02 HINGES

- A. Manufacturers: One of the following or equal:
 - 1. Stanley.
 - 2. Hager.
 - 3. McKinney.
 - 4. Ives.
- B. Material:
 - 1. Interior office doors: Brass.

2. Interior doors in operation areas: Brass.
 3. Exterior doors: Stainless steel.
- C. Knuckles, number of: Minimum 5.
- D. Ball bearings: Concealed with interior self-lubricating bushings.
- E. Type for doors with closers: Ball bearing.
- F. Material for fire-resistive rated doors: Steel.
- G. Pins for interior doors: Non-rising.
- H. Pins for exterior doors: Non-removable.
- I. Template hinges: BHMA A156.7.
- J. Tips: Flat button.
- K. Height: As follows, unless otherwise specified:
1. Doors 1-3/8-inch thick: 3-1/2 inches.
 2. Doors 1-3/4-inch thick and up to 41 inches wide: 4-1/2 inches.
 3. Doors 1-3/4-inch thick and from 41 to 48 inches wide: 4-1/2 inches, extra heavy.
 4. Doors 2 inches thick or over 48 inches wide: 5 inches, extra heavy.
- L. Widths: Sufficient to clear trim projection when door swings 180 degrees, unless otherwise specified.
- M. Number per door leaf: As follows, unless otherwise specified:
1. 3 hinges on door to 7 feet, 6 inches in height.
 2. 1 additional hinge for each additional 2 feet, 6 inches of height or fraction thereof.

2.03 LOCKSETS

- A. Manufacturers typical: Sargent, as scheduled.
- B. Permanent Cylinders: Cylinders as manufactured by Sargent, minimum 6 pins.
- C. Strikes:
1. Material: Same as lock trim.
 2. Lock and latch boxes: Wrought.
 3. Lips: Extended, able to protect trim from marring by latch bolt.
 4. Cutouts at metal frames: In accordance with ANSI, unless otherwise specified.
- D. Levers: Type that returns to within 1/2 inch of door.
- E. Backset: 2-3/4 inches.
- F. Trim materials: As follows, unless otherwise specified:
1. Typical: Stainless steel.

2.04 CONSTRUCTION KEYING

- A. Type: Removable core system.
- B. Contractor's temporary cores shall be removed by the City's locksmith. Contractor shall give core removal key to City.

2.05 PERMANENT KEYING AND KEYS

- A. City locksmith will install permanent cores.

2.06 CLOSERS

- A. Manufacturers: Heavy duty, non-handed and non-sized, adjustable spring power from size 1 through 4, hold open feature where specified, manufacturer's special rust inhibitive epoxy primer on every part. One of the following or equal:
 - 1. Dorma, 7801 Series.
 - 2. Sargent EN-351 PH9.
- B. Type: Full rack and pinion type with steel spring and non-gumming, non-freezing hydraulic fluid.
- C. Controls: Separate set for regulating sweep speed, latch speed, backcheck and backcheck positioning, or where schedules, spring power.
- D. Sizes: As recommended by accepted manufacturer.
- E. Covers: Plastic, capable of being spray painted to match adjacent hardware finishes, unless otherwise specified.
- F. Narrow frame provisions: Drop plates.
- G. Effort to operate: As follows:
 - 1. Exterior: Maximum 8-1/2 pounds.
 - 2. Interior: Maximum 5 pounds.
 - 3. Fire-resistive rated doors: Maximum 15 pounds.
- H. Adjust closers in accordance with manufacturer's directions for size of door.

1.02 EXIT DEVICES

- A. Lever design:
 - 1. Manufacturers: The following or equal:
 - a. Von Duprin, Lever Model 06.
- B. Rim device, non-fire resistive rated:
 - 1. Manufacturers: One of the following or equal:
 - a. Von Duprin Inc., Model Series 98.
 - b. Sargent Essex Ind., Model Series 8800.
- C. Material: As scheduled.

1.03 MISCELLANEOUS DOOR HARDWARE

- A. Wall stops: As scheduled.
 - 1. Manufacturers: One of the following or equal:
 - a. Ives.
 - b. Trimco.
 - c. Rockwood.
- B. Floor stops: As scheduled with strike of suitable height to compensate for clearance between door and floor.
 - 1. Manufacturers: One of the following or equal:
 - a. Ives.
 - b. Trimco.
 - c. Rockwood.
- C. Mechanical holders: Foot-operated plunger with instant release by touch of toe and integral spring to keep constant shoe pressure against floor; brass.
 - 1. Manufacturers: The following or equal:
 - a. Glynn-Johnson.
- D. Manual flush bolts: Mortise, bar with stop-mounted coordinator and strikes; materials as scheduled.
 - 1. Manufacturers: One of the following or equal:
 - a. Glynn-Johnson.
 - b. Hager Hinge Co.
- E. Kick plates: As scheduled, 0.050-inch thick, beveled edges, 10 inches high, 1-1/2 inches narrower than single doors, 1 inch narrower than leaf of door pairs.
 - 1. Manufacturers: One of the following or equal:
 - a. Ives.
 - b. Trimco.
- F. Gasketing systems: As scheduled, self-adhesive silicone seal, continuous at head and jambs, rated for fire and smoke in accordance with ASTM E283, sound rated in accordance with ASTM E90.
 - 1. Manufacturers: One of the following or equal:
 - a. Pemko Mfg. Co.
 - b. National Guard Products Inc.
 - c. Reese.
- G. Weatherstripping for exterior doors and smoke, light, and sound seals for interior doors.
- H. Thresholds: As scheduled, extruded aluminum, maximum 1/2-inch high, maximum slope of 1 foot in 2 feet.
 - 1. Manufacturers: One of the following or equal:
 - a. National Guard Products Inc.
 - b. Pemko Mfg. Co.
- I. Dustproof strike: As scheduled.
 - 1. Manufacturers: One of the following or equal:
 - a. Ives.
 - b. Trimco.

- J. Coordinator with filler bar: As scheduled, non-handed, series type length as required for door sizes indicated, complete with filler lengths as required, with mounting brackets and carry bars when required for proper operation; steel with manufacturer's standard prime finish capable of receiving painted finish.
 - 1. Manufacturers: One of the following or equal:
 - a. Glynn-Johnson Coordinators, Model COR Series.
 - b. Ives, Door Co-Ordinator, Model 900 Series.
- K. Door bottoms: As scheduled, extruded aluminum with vinyl insert, surface mounted, length equal to door width minus 2 inches, automatic, recessed in bottom of door.
 - 1. Manufacturers: One of the following or equal:
 - a. Pemko.
 - b. Reese.
- L. Astragals: As specified in Sections 08110 - Hollow Metal Doors and Frames.
- M. Silencers: As scheduled, pneumatic gray rubber.
 - 1. Manufacturers: One of the following or equal:
 - a. Trimco.
 - b. Ives.
 - c. Rockwood.

1.04 FINISHES

- A. Brass and bronze: BHMA A156.18 626 (US26D), satin chrome.
- B. Steel: BHMA A156.18 652 (US26D), satin chrome.
- C. Stainless steel: BHMA A156.18 630 (US32D), satin stainless steel.
- D. Aluminum: BHMA A156.18 628 (US28).
- E. Plastic closer covers: Spray paint to match typical door hardware finish.
- F. Metal closer covers: Plate covers to match typical door hardware finish.
- G. Electromagnetic hold open devices: Manufacturer's standard brushed zinc finish.

1.05 ELECTRONIC LOCKING SYSTEM

- A. Card Reader: Provide an electronic card reader. Manufacturers:
 - 1. HID Model No.: ProxPoint Plus Reader 6005B.
- B. Cards: Provide 10 cards to the City of Turlock.
- C. Controller: Provide a controller for the card reader and electronic door strike: Manufactures:
 - 1. HID Model No: EdgePlus Solo ES400.

PART 2 EXECUTION

2.01 EXAMINATION

- A. Inspect doors and door frames for damage or defects and examine hardware for compatibility with receiving conditions and suitable to intended use.
- B. Verify that required wall backing has been installed.

2.02 INSTALLATION

- A. Install finish hardware in accordance with manufacturer's templates and instructions.
- B. Accurately and properly fit hardware.
- C. Securely fasten fixed parts for smooth, trouble-free, non-binding operation.
- D. Fit faces of mortise parts snug and flush.
- E. Ensure that operating parts move freely and smoothly without binding, sticking, or excessive clearance.
- F. Protection:
 - 1. Protect door hardware from damage or marring of finish during construction, use strippable coatings, removable tapes, or other acceptable means.
 - 2. Ensure door hardware displays no evidence of finish paint after final building cleanup with exception of prime-coated door hardware installed for finish painting.
- G. Latch guard and dead bolts: Install so that bolts automatically engage in keeper, whether activated by closer or by manual pressure.
- H. Closers:
 - 1. Mount on opposite sides of corridors or vestibules, except at exterior doors.
 - 2. Mount for 180-degree swing wherever possible.
 - 3. Mount with drop plates at narrow top rail doors.
 - 4. Adjust to operate noiselessly and evenly.
 - 5. Have closer manufacturer regulate closers prior to final acceptance of project.
- I. Gasketing: Mount to provide complete contact between door and frame, finished floor, or both; and weathertight enclosure.
- J. Thresholds:
 - 1. Install immediately before inspection for Substantial Completion or protect from heavy traffic damage during construction.
 - 2. Cope to fit door frame profile and drill to suit required flush bolts and panic bolts.
 - 3. Unless **indicated on the Drawings** to be set in grout, set in double bead of sealant, tightly fit at jambs, and make waterproof.
 - 4. Fasten to concrete slab with 5/16-inch stainless steel flat head countersunk machine screws and concrete anchors at 8-inch centers.

- K. Silencers: Insert into predrilled holes in frames.
- L. Install Card reader and controller to automatically open door when coded card is swiped in front of the card reader. Coordinate with the City of Turlock for coding of the Card key.

2.03 CONSTRUCTION KEYING

- A. Insert construction cores in cylinders of exterior doors, and doors requiring security and access for workman, unless otherwise directed by the Engineer.

2.04 ADJUSTING

- A. Examine hardware in place for complete and proper installation. Lubricate bearing surfaces for proper function.
- B. Replace, rework or otherwise correct defective door hardware, including incorrect hand or function.

2.05 CLEANING

- A. Remove protective materials and devices and thoroughly clean exposed surfaces of hardware.
- B. Check for surface damage prior to final cleaning for acceptance of project.

2.06 HARDWARE SCHEDULE

- A. While the Hardware Schedule is intended to cover all doors and other moveable parts of the building and establish a type and standard of quality, it shall be the specific duty and responsibility of the finish hardware supplier to examine the Drawings and Specifications and furnish proper hardware for all openings.

2.07 HARDWARE GROUPS

- A. Hardware sets:

<u>HARDWARE GROUP HW-1</u>		
<u>Hinges</u>	<u>3</u>	<u>Stanley, FBB 191, NRP, US32D</u>
<u>Hinges</u>	<u>1</u>	<u>Stanley, CEFBB 191-54, NRP, US32D</u>
<u>Mortise Lockset</u>	<u>1</u>	<u>Sargent, RX-8271-12V, LNJ, US32D</u>
<u>Closer</u>	<u>2</u>	<u>Sargent, EN-351, PH9</u>
<u>Threshold</u>	<u>1</u>	<u>Pemko 170A</u>
<u>Weatherstrip</u>	<u>1</u>	<u>Pemko 303AS</u>
<u>Door Bottom</u>	<u>1</u>	<u>Pemko 222AV</u>
<u>Kick Plate</u>	<u>2</u>	<u>Trimco, K0050 (size per manufacturer's recommendation)</u>
<u>Card reader</u>	<u>1</u>	<u>By others</u> ^{AD3}

HARDWARE GROUP HW-2		
Hinges	4	Stanley, FBB 191, NRP, US32D
Mortise Lockset	1	Sargent, 8271, LNJ, US32D
Closer	1	Sargent EN-351 PH9
Kick Plate	1	Trimco, K0050 (size per manufacturer's recommendation)

HARDWARE GROUP HW-3		
Hinges	42	Stanley, FBB 191, NRP, US32D
Hinges	4	Stanley, CEFBB 191-54, NRP, US32D ^{AD3}
Mortise Lockset	1	Sargent, RX ^{AD3} 8271- 12V ^{AD3} , LNJ, US32D
Flush Bolts	Pair	Glynn-Johnson, DP1, US26D, inactive leaf
Closer	2	Sargent, EN-351, PH9
Threshold	1	Pemko 170A
Weatherstrip	1	Pemko 303AS
Door Bottom	1	Pemko 222AV
Kick Plate	2	Trimco, K0050 (size per manufacturer's recommendation)

HARDWARE GROUP HW-4		
Hinges	68 ^{AD3}	Stanley, FBB 191, NRP, US32D
Hinges	4	Stanley, CEFBB 191-54, NRP, US32D ^{AD3}
Closer	2	Sargent EN-351 PH9
Threshold	1	Pemko, 170 A
Weatherstrip	1 Set	Pemko, 303 AS
Door Bottom	2	Pemko, 222 AV
Kick Plate	1	Trimco, K0050 (size per manufacturer's recommendation)
Flush Bolts	Pair	Trimco, 3917-12, inactive leaf
Dust Proof Strike	1	Glynn-Johnson, DP1, US26D, inactive leaf
Mortise Panic Bar	1	Von Duprin, 996L-NL- RX ^{AD3} US32D

HARDWARE GROUP HW-5		
Hinges	4	Stanley, FBB 191, NRP, US32D
Hinges	4	Stanley, CEFBB 191-54, NRP, US32D ^{AD3}
Closer	1	Sargent EN-351 PH9
Threshold	1	Pemko, 170 A
Weatherstrip	1 Set	Pemko, 303 AS
Door Bottom	1	Pemko, 222 AV
Kick Plate	1	Trimco, K0050 (size per manufacturer's recommendation)
Mortise Panic Bar	1	Von Duprin, 996L-NL RX, US32D

END OF SECTION

^{AD3} Addendum No. 3

SECTION 13207

STRAND-WOUND CIRCULAR PRESTRESSED CONCRETE TANK WITH A TYPE I CORE WALL AND DOMED ROOF

PART 1 GENERAL

1.01 SUMMARY

A. Work includes:

1. This section specifies the design and construction of an AWWA D110, Type 1, strand-wrapped circular prestressed concrete tank, furnishing, installation, and testing. The tank shall consist of: foundation, underdrain system, concrete membrane floor slab, cast-in-place concrete core wall, cast-in-place concrete domed roof, and all associated appurtenances. The core wall shall be vertically post-tensioned with thread bars, prestressed circumferentially with machine-wrapped seven-wire galvanized strand, and protected with several coats of shotcrete. The foundation shall be constructed with continuous shallow concrete spread footings below the perimeter wall. The concrete floor shall be constructed with a concrete slab on grade.
2. In the event of a discrepancy between this section of the Specifications and any other section of the Specifications, this section shall govern.
3. The Tank Contractor shall furnish all labor, materials, tools, and equipment necessary to design, construct, and test the prestressed concrete tank.

B. Related sections:

1. Section 01757 – Disinfection.
2. Section 01759 – Water Leakage Test for Concrete Structures.
3. Section 03102 - Concrete Formwork.
4. Section 03150 - Concrete Accessories.
5. Section 03200 - Concrete Reinforcing.
6. Section 03300 - Cast-In-Place Concrete.
7. Section 03931 - Epoxy Injection System.
8. Section 09960 - High-Performance Coatings.

1.02 REFERENCES

A. Abbreviations:

1. cfm - cubic feet per minute.
2. f'c - specified compressive strength of concrete.
3. g - gravitational constant, equal to 32.2 feet per second squared.
4. gpm - gallons per minute.
5. ksi - kips per square inch.
6. MG - million gallons.
7. mph - miles per hour.
8. pcf - pounds per cubic foot.
9. psf - pounds per square foot.
10. psi - pounds per square inch.
11. PVC - polyvinyl chloride.
12. sec - seconds.

B. Definitions:

1. Core Wall - That portion of the concrete tank wall that is circumferentially post-tensioned.
2. Prestressed Concrete - Concrete in which internal compressive stresses of such magnitude and distribution have been introduced through post-tensioning to offset tensile stress development from service loads.
3. Prestressing Reinforcement - High-strength steel used to prestress the concrete tank wall.
4. Rebound - The shotcrete material that ricochets off of the receiving surface and falls.
5. Shotcrete - Pneumatically applied wet mortar or concrete used for embedment protection of the circumferential prestressed wall reinforcement.
6. Strand - A symmetrically arranged and helically twisted assembly of seven high-strength steel wires used for prestressing reinforcement or as nonprestressed seismic cables.
7. Stressing Machine - May refer to the automated wrapping machinery used to post-tension the strand around the tank circumference or vertical post-tensioning equipment used to post-tension vertical thread bars.
8. Tank Contractor - A qualified tank manufacturer and/or contractor that specializes in the design and construction of an AWWA D110 type of tank specified herein.
9. Tank Prestressor – A contractor or sub-contractor that specializes in the design of an AWWA D110 type of tank and specializes in the construction of the prestressed elements of the tank, such as the strand/wire wrapping and the vertical post-tensioning of the wall.^{AD2}
- ~~9,10.~~ Tendon - High-strength thread bar, including end anchorages, used to impart vertical prestressed forces to the tank wall.
- ~~10,11.~~ Wire - High-strength, cold-drawn steel wire used to assemble strands.

C. Reference Standards:

1. American Concrete Institute (ACI):
 - a. ACI 301-16 - Specifications for Structural Concrete, 2016.
 - b. ACI 305.1-14 - Specification for Hot Weather Concreting, 2014.
 - c. ACI 306.1-90 - Standard Specification for Cold Weather Concreting, 1990.
 - d. ACI 350-06 - Code Requirements for Environmental Concrete Structures and Commentary, 2006.
 - e. ACI 350.1-10 - Specification for Tightness Testing for Environmental Engineering Concrete Containment Structures and Commentary, 2010.
 - f. ACI 350.3-06 - Seismic Design of Liquid-Containing Concrete Structures and Commentary, 2006.
 - g. ACI 350.5-12 - Specifications for Environmental Concrete Structures, 2012.
 - h. ACI 372R-13 – Design and Construction of Circular Wire- and Strand-Wrapped Prestressed Concrete Structures, 2013.
 - i. ACI 506R-16 - Guide to Shotcrete, 2016.
 - j. ACI 506.2-13 – Specification for Shotcrete, 2013.
2. ASTM International (ASTM):
 - a. A 416 - Standard Specifications for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.
 - b. A 475 - Standard Specification for Zinc-Coated Steel Wire Strand.
 - c. A 615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

- d. A 706 - Standard Specification for Low-Alloy Deformed and Plain Bars for Concrete Reinforcing.
 - e. A 722 - Standard Specification for Uncoated High-Strength Steel Bars for Prestressed Concrete.
 - f. C 33 - Standard Specification for Concrete Aggregates.
 - g. C 150 – Standard Specification for Portland Cement.
 - h. C 171 - Standard Specification for Sheet Materials for Curing Concrete.
 - i. C 618 - Type F Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 - j. D 570 - Standard Test Method for Water Absorption of Plastics.
 - k. D 624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 - l. D 638 – Standard Test Method for Tensile Properties of Plastics.
 - m. D 746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
 - n. D 747 - Standard Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam.
 - o. D 792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
 - p. D 1056 - Standard Specification for Flexible Cellular Materials- Sponge or Expanded Rubber.
 - q. D 2000 - Standard Classification System for Rubber Products in Automotive Applications.
 - r. D 2240 - Standard Test Method for Rubber Property-Durometer Hardness.
- 3. American Society of Civil Engineers (ASCE):
 - a. 7-16 - Minimum Design Loads for Buildings and Other Structures.
 - 4. American Water Works Association (AWWA):
 - a. C652 - Standard for Disinfection of Water-Storage Facilities.
 - b. D110-13 - Wire- and Strand-Wound, Circular, Prestressed Concrete Water Tanks, 2013.
 - 5. NSF International (NSF):
 - a. 61 – Drinking Water System Components – Health Effects.
 - 6. Code of Federal Regulations (CFR):
 - a. Part 1910 – Occupational Safety and Health Standards (OSHA).
 - 7. U. S. Army Corps of Engineers (USACE):
 - a. CRD C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop.

1.03 SUBMITTALS

- A. Product data:
 - 1. Admixtures:
 - a. Submit evidence of NSF 61 compliance for all concrete admixtures.
 - 2. Waterstops:
 - a. Submit samples, prints, and complete physical property data covering waterstops.
 - b. Laboratory test reports: Submit reports indicating that average properties of polyvinyl chloride waterstops material and finish conform to requirements specified in this Section.
 - 3. Epoxy grouting equipment: Submit product information.
 - 4. Neoprene bearing pads: Submit product information.

5. Stressing machine:
 - a. Submit a description of the proposed equipment.
 - b. Submit calibration reports for force recording equipment used installation of vertical thread bars and circumferential prestressing.
- B. Shop drawings:
 1. Drawings showing all plan views, sections, and details of the tank construction, including, but not limited to, all structural elements, all appurtenances, connections, joints, waterstop, roof hatches, vents, ladders, fall arrest and protection systems, guardrails, piping, pipe penetrations, pipe supports, sub-grade preparation, base liners, tank instrumentation, and materials for roof drainage and conductance.
 2. Drawings of entire prestressing operation showing vertical thread bar and circumferential strand placement with associated schedules and intermediate lock-off elevations, prestressing bar and strand size, ducts for vertical thread bars, and anchorage details.
 3. Drawings for placement and detailing of all reinforcing steel.
 4. Drawings showing:
 - a. Neoprene bearing pads and methods of pad installation.
 - b. Waterstop and methods of installation.
 - c. Sponge filler pads or sleeves and methods of installation.
 - d. Exterior coating system.
 5. All shop drawings shall be signed and sealed by a registered California structural or civil engineer.
- C. Design Submittals:
 1. Structural calculations for all aspects of the structural design of the tank, along with calculations for prestressing reinforcement, elongation estimates, soil capacity checks, and calculations for any other structural design aspect.
 2. Concrete mix designs in accordance with Specification 03300 and additional provisions specified herein.
 3. Shotcrete mix designs in accordance with the provisions specified herein.
 4. Admixtures to be used in the concrete and/or shotcrete and their purpose.
 5. All design submittals shall be signed and sealed by a registered California structural or civil engineer.
- D. Tank responsibility statement:
 1. The Tank Contractor shall submit a statement attesting that they have assumed responsibility for the tank design and construction. ~~The statement shall be signed and sealed by the Tank Contractor's engineer in responsible charge of the tank design.~~^{AD2} No other submittal items will be reviewed until a satisfactory statement has been received.
- E. Qualifications statement:
 1. Failure to submit a qualifications statement package will be deemed an irregularity, which will cause bid to be rejected as nonresponsive.
 2. Submit pertinent information that demonstrates conformance with Quality Assurance requirements specified herein.
 3. To include:
 - a. Company history, contact person(s), address, and telephone number.
 - b. Project references with owner and engineer's contact information.

- c. Name and work history of the on-site project manager to be assigned to the project.
- F. Quality control submittals:
 - 1. Certificates of Compliance:
 - a. Thread Bars: Submit certified test reports that verify bars and anchorage meet specified material standards.
 - b. Waterstop: Submit certificates certifying that waterstops provided on this project meet or exceed physical property requirements of current USACE CRD C 572.
 - c. Circumferential prestressing: Submit certified test reports for each size, heat, and reel that verify conformance to applicable ASTM standards for materials, strength, and yield properties.
- G. Test reports:
 - 1. Strand and vertical thread bar prestressing records.
- H. Manufacturer's instructions:
 - 1. Tank appurtenances: Submit manufacturer's installation instructions.

1.04 NON-RESPONSIVE BID

- A. Qualifications statement package:
 - 1. Submit a qualifications statement package with the bid. The package shall contain information as required per Section 1.03.E.
 - 2. Failure to submit a qualifications statement package will be deemed an irregularity that may cause bid to be rejected as non-responsive.

1.05 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Singular Responsibility:
 - a. It is the intent of these Specifications to create singular responsibility for design, construction, and performance of the prestressed concrete tank. The design and construction of all aspects of the foundation, floor slab, core wall, prestressing, shotcrete, and domed roof of the tank shall be performed by the Tank Contractor.
 - ~~1) The Tank Contractor may subcontract labor for reinforcing steel installation and for concrete slab finishing under the Tank Contractor's direct supervision. No other portion of the work on the tank shall be subcontracted unless:~~
 - ~~a) Acceptance is obtained from the Engineer in writing prior to the Bid Date.~~
 - 1) The Tank Contractor may subcontract with a Tank Prestressor as required for the design and construction of the tank.
 - 2) The Tank Contractor shall have a working agreement with the Tank Prestressor in which the Tank Contractor is approved by the Tank Prestressor to perform all construction of the specified tank except the prestressing.
 - 3) The Tank Contractor agrees to meet the minimum standard of care required by the Tank Prestressor and their design or as specified herein, whichever is more stringent.

- 2) Skill of nozzleman:
 - a) Capable of applying thin coats of even and uniform thickness.
 - b) Certified shotcrete nozzleman in accordance with ACI 506R.
3. The specified tank shall be designed by the Tank Prestressor. The Tank Prestressor shall have in its employ a design engineer with a minimum of ten years of experience in the design of AWWA D110 Type I tanks with domed or flat-slab concrete roofs. The design engineer shall have been the engineer of record for a minimum of ten AWWA D110 Type I tanks designed by the Tank Prestressor in its own name. The design engineer shall be licensed as a civil or structural engineer in the state of California.
 - a. No Tank Prestressor is considered qualified unless it has designed the following projects:
 - 1) At least ten circumferentially prestressed concrete tanks with domed concrete roofs conforming to AWWA D110, Type I in the last twenty years.
 - 2) At least five circumferentially prestressed concrete tanks with domed concrete roofs conforming to AWWA D110, Type I used for water storage that have been in successful operation for at least five years.
 - 3) At least five circumferentially prestressed concrete tanks with domed concrete roofs conforming to AWWA D110, Type I that are 1.0 MG or larger in the last ten years.^{AD2}
- ~~3.4.~~ Experience in the design and construction of AWWA D110 Type II, Type III, or Type IV tanks will not be accepted as demonstrating the qualifications required by the preceding paragraphs.

1.06 DESIGN CRITERIA

- A. Except as modified herein, the prestressed concrete tank shall be designed and constructed in compliance with the provisions of AWWA D110 for strand-wound circular, prestressed concrete water tanks with Type I core wall.
 1. The prestressed concrete tank core wall shall be of cast-in-place concrete construction. Shotcrete or precast core walls are not permitted under the provisions of this Section.
- B. Standards/Codes:
 1. The prestressed concrete tank shall be designed and constructed as specified herein, and in accordance with provisions of the following standards and codes:
 - a. AWWA D110-13.
 - b. California Building Code, 2019.
 - c. ACI 350-06 with modifications per ASCE 7-16 §15.7.7.3.
 - d. ACI 350.3-06.
 - e. ASCE 7-16.
 2. Where conflicts between the requirements of this Section and of these standards and codes occur, the more restrictive provisions shall apply.
 - a. Exception: Requirements for concrete cover and member thickness shall be as specified in this Section.

- C. California Department of Public Health:
1. Contractor is advised that the prestressed concrete tank specified herein will be used in potable water service.
 2. All admixtures used in the concrete mix design for the prestressed concrete tank shall be certified in compliance with NSF 61.
- D. Load criteria and requirements to be used by the Tank Contractor in the design calculations:
1. Capacity: 2.3 MG usable storage below the maximum water elevation shown on the Drawings.
 - a. Inside Diameter: 125 feet.
 2. Dead Load: shall be the estimated weight of all permanent imposed loads.
 - a. Unit weight of concrete shall be taken as 150 pounds per cubic foot.
 - b. Unit weight of steel shall be taken as 490 pounds per cubic foot.
 3. Fluid Load: shall be the lateral pressure and weight of the water when the tank is filled to a level that is 6 inches above the elevation of the top of the overflow elevation as indicated on the Drawings (to allow for overflow conditions).
 - a. Unit weight of water shall be taken as 62.4 pounds per cubic foot.
 4. Dome Live Load:
 - a. Uniform: 40 pounds per square foot, non-reducible.
 - b. Any concentrated reactions due to the use of fall protection equipment.
 - c. Application of fall protection equipment reaction loads shall be applied concurrently with uniform roof live load. However, load factors for the load case where the combination of uniform and fall protection reactions are considered simultaneously may be taken as unity.
 5. Construction Loads:
 - a. Loads applied to the tank during construction shall be accounted for in the design of the tank.
 6. Geotechnical Report: See Section 00800 – Supplementary Conditions.
 7. Foundation Loads: the tank foundation shall be proportioned so that the net foundation bearing pressure shall be less than the net allowable soil bearing pressure specified in the Geotechnical Report.
 - a. The allowable soil bearing pressure may be increased by 33 percent for load combinations that include wind or seismic loads.
 - b. Settlement Loads: the tank shall be designed to resist the effects of total and differential settlement indicated in the Geotechnical Report.
 8. The final design for wind and seismic loads shall consider a reduced capacity to resist sliding due to membranes placed between the bottom of the concrete foundation and the soil.
 9. Wind Load: determined in accordance with ASCE 7-16.
 - a. Exposure Category C.
 - b. Basic Wind Speed $V = 104$ mph (3-sec gust).
 - c. Importance Factor, $I_w = 1.00$.
 10. Seismic Design Criteria: seismic design shall be based on the applicable sections of AWWA D110-13, ASCE 7-16, and ACI 350.3-06. The seismic forces shall be calculated using each code separately. The total base shear used for design shall be the maximum value obtained from the three codes used.
 - a. When comparing force and base shear values, those obtained from ASCE and ACI shall be based on service level loads.
 - b. AWWA D110-13 Design Criteria:
 - 1) Occupancy Category, IV.

- 2) Importance Factor, $I = 1.50$.
 - 3) Design Spectral Acceleration for Short Period, $S_{DS} = 0.64g$.
 - 4) Design Spectral Acceleration for 1-second Period, $S_{D1} = 0.52g$.
 - 5) Site Class D.
 - 6) Impulsive Structure Coefficient, $R_I = 3.5$.
 - 7) Convective Structure Coefficient, $R_C = 1.0$.
 - 8) Overstrength Factor, Ω_o , 2.0.
- c. ASCE 7-16 Design Criteria:
- 1) Risk Category IV.
 - 2) Design Spectral Acceleration for Short Period, $S_{DS} = 0.64g$.
 - 3) Design Spectral Acceleration for 1-second Period, $S_{D1} = 0.52g$.
 - 4) Site Class D.
 - 5) Response Modification Factor, $R = 3.25$.
 - 6) Overstrength Factor, Ω_o , 2.0.
 - 7) Long-period Transition Period, $T_L = 12$ sec.
 - 8) Importance Factor, $I_e = 1.50$.
- d. ACI 350.3-06 Design Criteria:
- 1) Design Spectral Acceleration for Short Period, $S_{DS} = 0.64g$.
 - 2) Design Spectral Acceleration for 1-second Period, $S_{D1} = 0.52g$.
 - 3) Site Class D.
 - 4) Impulsive Structure Coefficient, $R_I = 3.25$.
 - 5) Convective Structure Coefficient, $R_C = 1.0$.
 - 6) Long-period Transition Period, $T_L = 12$ sec.
 - 7) Importance Factor, $I = 1.50$.
- e. The sloshing wave height shall be taken as the larger of the values calculated in accordance with AWWA D110-13, ASCE 7-16, and ACI 350.3-06.
- 1) In the event that the calculated height of the "sloshing wave" exceeds the freeboard of the tank (distance from the maximum operating water surface elevation to the bottom of the dome at the wall), the tank and the dome shall be designed to accommodate the dynamic effects as follows:
 - a) Any portion of the convective sloshing wave that extends above the top of the tank wall (bottom of the dome at the wall) shall be calculated and applied to the dome as an uplift pressure in accordance with section 15.7.6.1.2.e of ASCE 7-16.
 - b) Additionally, the mass of any confined portion of the convective sloshing wave shall be included with the impulsive mass used in the estimation of the hydrodynamic forces applied to the tank for design, also in accordance with section 15.7.6.1.2.e of ASCE 7-16.
 - c) Any revisions to the tank, including but not limited to, the dome elevation, and water overflow level, that are required to meet the specified provisions to resist sloshing loads and its effect on the hydrodynamic design shall not result in additional costs to the Owner.
11. Temperature and moisture gradients: effects due to changes in temperature and due to temperature and moisture gradients across structural members shall be considered in the design. Refer to Section 01610.
12. Prestressing application: forces applied to the wall shall be considered in the design of the wall, especially where wall penetrations result in locally increased prestressing force application to the wall.

13. Vent Capacity Requirements (after accounting for resistance to air flow based on screen mesh size and screen open area):
 - a. The vent shall be sized for a minimum rate of 750 cfm or the rate of volumetric withdrawal assuming the outlet pipe has ruptured, whichever is greater.
14. Overflow Design Capacity: ~~33,300 gpm~~ 26,000 gpm^{AD3} with maximum 9-inch water height over the top of the overflow weir.

E. Floor Slab and Wall Footing Requirements:

1. The floor slab shall be designed as a membrane floor slab as defined in ACI 372R, Section 3.2.2 that is not less than 6.5 inches thick; or the floor slab may be designed as a slab-on-ground with a thickness not less than 6.5 inches.
2. Construction joint locations shall be submitted to the Engineer for review.
 - a. Where construction joint spacing exceeds 50 feet, provide means for reducing shrinkage below the limit specified in Section 03300 in proportion to the extent the spacing limit of 50 feet is exceeded.
 - b. Use of construction joints in the floor slab shall be minimized.
3. Minimum ratio of floor slab reinforcement area to concrete area shall be 0.5 percent for each orthogonal direction, with bars spaced no greater than 12 inches on center or two times the slab thickness, whichever is less.
4. Minimum concrete cover over reinforcing steel shall be in accordance with Table 3.3.2.3 of ACI 350.5.
5. Wall footings shall bear below floor sub-grade and shall be placed monolithically with the floor slab.
 - a. The bottom of the wall footing shall be embedded a minimum of 18 inches below the lowest finish grade elevation over the outside edge of the footing or as indicated on the Drawings, whichever is greater.
6. Design of the floor and wall footing shall consider the differential base stiffness and at concrete encasements or hard points below the floor and wall footing.

F. Wall Design Requirements:

1. The prestressed concrete tank wall shall be constructed with a cast-in-place core wall that is circumferentially wrapped with seven-wire strand prestressing reinforcement at the exterior and encapsulated within protective shotcrete layers. The core wall is to be vertically prestressed with post-tensioned thread bars.
2. The thickness of the core wall shall not be less than 10 inches thick.
3. The minimum average vertical compressive axial prestress in the core wall provided by the vertical prestressing reinforcement shall be 200 psi after deduction for all losses.
 - a. Vertical prestressing reinforcement shall be spaced on average no greater than 50 inches on center or seven times the thickness of the core wall, whichever is less.
4. The minimum average circumferential residual prestress compression in the wall shall not be less than 200 psi.
5. The connection between the base of the wall and the foundation shall be an anchored flexible connection in accordance with Section 4.2.1 and Figure 4B of AWWA D110-13.
 - a. The joint at the base of the wall shall permit unrestrained radial expansion and contraction of the wall relative to the foundation.

- b. The joint at the base of the wall shall provide restraint against lateral seismic loads acting tangentially to the wall.
 - c. Restraint cables shall be provided between the core wall and the foundation to resist seismic loads. The cable installation shall be detailed in a manner that does not introduce radial restraint between the wall and the foundation.
- 6. The minimum concrete cover over non-prestressed reinforcing shall be in accordance with Table 3.3.2.3 of ACI 350.5 with the following exception:
 - a. Provide minimum 2" concrete cover on inside face of concrete wall exposed to liquid for non-prestressed reinforcing.
- 7. Vertical non-prestressed reinforcing:
 - a. Provide vertical non-prestressed reinforcing over the full height of the wall.
 - b. The tensile stress shall be limited to a maximum of 18,000 psi.
 - c. Reinforcing size shall not exceed 3/4-inch in diameter.
 - d. Reinforcing spacing shall not exceed 12 inches on center.
- 8. Horizontal non-prestressed reinforcing:
 - a. Provide horizontal non-prestressed reinforcing around the entire perimeter of the wall. The reinforcing shall be continuous through vertical joints in wall.
 - b. Reinforcing size shall not exceed 3/4-inch in diameter.
 - c. Reinforcing spacing shall not exceed 12 inches on center.
- G. Domed Roof Design Requirements:
 - 1. The roof shall be a domed, cast-in-place concrete structure. Columns or interior supports will not be allowed.
 - 2. The minimum thickness of the domed roof shall be 4 inches.
 - 3. The dome shall be fixed to the tank wall.
 - 4. Minimum concrete cover over reinforcing steel shall be in accordance with Table 3.3.2.3 of ACI 350.5.
 - 5. The reinforcing steel for the roof structure shall be sized in accordance with ACI 350 with the environmental durability factor, S_d , applied to limit flexural stress. Reinforcing steel shall be proportioned and distributed to control cracking for normal environmental exposure.
 - 6. The effects of thermal expansion and contraction shall be accounted for in the design of the roof structure. Appurtenances and roof connections shall be detailed to limit restraint to thermal radial movement.
 - 7. The Tank Contractor shall submit, for the Engineer's approval, a plan showing the roof configuration that includes construction joints. Construction joints shall incorporate a 6-inch PVC waterstop.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Prestressing steel shall be adequately packaged for protection against corrosion and physical damage during shipping and storage.
- B. Prestressing steel that has rusted or has otherwise sustained damage will be rejected.
- C. Prestressing material and appurtenances delivered to project site: Store off ground on planks, supported by 4-by-4 timber. Cover with polyethylene sheeting or treated paper to prevent exposure to moisture.

1.08 PROJECT CONDITIONS

- A. Environmental requirements:
 - 1. Cold weather epoxy grouting of tendons:
 - a. In cold weather, and especially during frosts, take special precautions to avoid freezing of epoxy.
 - b. In event that grouting procedure cannot be postponed, keep wall temperature above freezing point with hot blankets or by other means acceptable to Engineer.
- B. Site safety precautions:
 - 1. Take every precaution to keep personnel and visitors outside the area of danger from breaking prestressing strands or bars.
 - 2. At no time shall anyone stand in the line of stressed circumferential strand.
 - 3. No work shall be performed by anyone, other than the prestressing crew within 100 feet of circumferential wrapping operation or vertical bar stressing operation.
 - 4. Where access to the site by unauthorized persons cannot be controlled while prestressing work is in progress, or where property lines are less than 100 feet from the wrapping operation, erect protective fencing to prevent breaking strands from endangering such persons.
- C. Welding:
 - 1. Perform no welding to anchor plates after prestressing tendons have been assembled.
 - 2. Do not use prestressing steel as ground for welding operations.

1.09 SEQUENCING AND SCHEDULING

- A. Polyvinyl chloride waterstops:
 - 1. Welding of polyvinyl chloride waterstops: Prior to installing waterstops in forms, demonstrate ability to weld acceptable joints in waterstops.
 - 2. Quality of welded joints: Are to be subject to acceptance of the Engineer.
- B. Restrictions on shotcrete operations:
 - 1. Abrasive Blasting:
 - a. Do not commence prior to the completion date of curing period of tank corewall.
 - b. Do not commence until all form tie holes have been drypacked.
 - 2. Wind conditions: Do not apply shotcrete under such strong wind conditions that considerable amount of cement and moisture is removed by wind from mortar spray between nozzle and surface on which shotcrete is applied.
 - 3. Temperature requirements:
 - a. Peak temperature during day must be expected to rise to at least 55 degrees Fahrenheit.
 - b. Night temperature of first night after shotcrete application must not be expected to drop below 33 degrees Fahrenheit.
 - 4. Cold weather conditions:
 - a. Application of shotcrete under cold weather conditions is solely at the Tank Contractor's risk.
 - b. Shotcrete may be applied in cold weather provided surfaces are not frozen.

- c. Damage to shotcrete: Whenever rain or frost damages shotcrete which has not had chance to take set:
 - 1) Remove and replace such shotcrete.
 - 2) Remove damaged shotcrete before applying any new layers of shotcrete.
 - d. Type III Portland cement may be utilized for shotcrete for cold weather application.
- C. Ultimate initial prestressing force for vertical thread bars: Do not apply until concrete compressive strength in walls reaches specified strength.
- D. Wrapping of circumferential prestressing strands:
 - 1. May start when core wall concrete has reached a compressive strength of 3,000 pounds per square inch and intermediate layers of shotcrete coats over prestressing strands has reached a compressive strength of 250 pounds per square inch or 12 hours after the shotcrete coat was applied, whichever is greater.
 - 2. The compressive stress in the concrete due to wrapping shall not exceed 55 percent of f'_c at any time.

1.10 GUARANTEE

- A. The Tank Contractor shall guarantee the structure against defective materials or workmanship for a period of two years from the final date of completion. If any materials or workmanship prove to be defective within two years, those materials shall be replaced or repaired by the Tank Contractor at the expense of the Tank Contractor.
- B. Access hatches and manways (through-roof and wall access) warranty:
 - 1. Manufacturer is to warranty proper operation and against defects in material or workmanship for a period of 5 years.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General:
 - 1. Materials of construction for the strand-wound prestressed concrete tank shall be selected by the Tank Contractor, subject to the limitations of this Section.
- B. Concrete:
 - 1. Concrete shall conform to Section 03300 and ACI 301, except as modified herein.
 - 2. Unless otherwise specified, all concrete for tank construction shall have a minimum 28-day compressive strength of 4,000 psi.
 - 3. The concrete for the tank floor, footings, and pipe encasement shall conform to the following requirements.
 - a. Concrete shall not be air-entrained.

- b. The coarse and fine aggregate shall meet the requirements of ASTM C33 and sized to meet member thickness and clearance requirements of ACI 350.
 - c. Superplasticizer and water-reducing admixtures shall be incorporated into the concrete for the floor slab and wall footing.
 4. Proportioning for concrete shall be in accordance with ACI 301.
 5. All concrete shall have a maximum water-soluble chloride ion concentration of 0.06 percent by weight of cement.
 6. Cement shall conform to ASTM C 150, Type I or Type II.
 7. Accelerating and retarding admixtures shall not be incorporated into the any concrete mix without prior acceptance by the Engineer.
- C. Reinforcing Steel:
 1. Reinforcing steel shall be new billet steel Grade 60 meeting the requirements of ASTM A 615.
 2. Reinforcing steel that is to be welded shall be ASTM A 706, Grade 60.
 3. Reinforcing steel shall be accurately fabricated and shall be free from loose rust, scale, and contaminants.
 4. Reinforcing steel shall be accurately positioned on supports, spacers, hangers, or other reinforcement and shall be secured in place with wire ties or suitable clips. Rebar chair supports shall be provided in accordance with Section 03200.
 5. Minimum reinforcing steel lap splice length shall be as indicated on Drawings.
- D. Prestressing Materials:
 1. Seven-wire strand:
 - a. Prestressing strand shall be in accordance with ASTM A 416 prior to hot-dip galvanizing.
 - b. Individually hot-dip galvanize each wire of strand before forming the wires into a strand.
 - c. Hot-dip galvanized 7-wire strand shall meet following minimum requirements:

Physical Characteristics	Required Results
Nominal Strand Diameter Before Galvanizing	3/8 inch
Nominal Area After Galvanizing	0.089 square inch
Nominal Weight Per 1,000 Linear Feet	303 pounds
Pitch of Strand	12 to 16
Minimum Yield Strength At 1 Percent Extension	180,000 psi
Minimum Ultimate Strength After Galvanizing	240,000 psi
Elongation In 24 Inches At Fracture	4.5 percent
Weight Of Zinc Coating per ASTM A475	0.85 ounces per square foot

2. High strength thread bars:
 - a. Thread bars and deformations: Hot rolled.
 - 1) Thread bars with cold rolled threads or with quenched or tempered steels will not be permitted.

- b. Deformations of thread bars:
 - 1) Provide deformations that form screw-thread suitable for mechanically coupling lengths of thread bar and provide positive attachment of anchor assemblies.
 - 2) Provide deformations that are in accordance with ASTM A 722, Type II requirements and are uniform such that any length of bar may be cut at any point and internal threads of coupler designated for that size of bar can be freely screwed on bar.
- c. Tensile and physical properties: Bars manufactured in accordance with ASTM A 722, Type II requirements are to comply with following minimum requirements:

Physical Characteristics	Required Results
Nominal Diameter	1.25 inches or 1.375 inches
Nominal Cross-sectional Area	1.245 square inches or 1.577 square inches
Nominal Bar Weight	4.39 pounds per foot or 5.56 pounds per foot
Minimum Tensile Stress	150 ksi
Minimum Yield Stress at 0.2 Percent Offset	120 ksi
Elongation At Rupture In Gauge Length of 20 Bar Diameters	4 percent minimum
Maximum Carbon Content of Bar	0.55 percent

- d. Nuts: Minimum ultimate strength shall be 95 percent of minimum ultimate strength of thread bar.
- 3. Anchorages for vertical post-tensioned thread bars:
 - a. All post-tensioned prestressing shall be secured at the ends by means of approved permanent anchoring devices, which shall hold the prestressing steel at a force not less than 95 percent of the guaranteed minimum tensile strength of the prestressing steel.
 - b. The load from the vertical prestressing anchoring device shall be distributed to the concrete through steel bearing plates and shall not exceed the values specified by the Post-Tensioning Institute (PTI), Guide Specifications, Paragraph 3.1.7.
 - c. Fully-threaded anchor connections shall be used at both ends of the vertical prestressing bar, which shall incorporate a spherical-shaped bearing surface to match the conical surface in the bearing plate.
 - d. Wedge anchors shall not be used for permanent anchor hardware.
- 4. Testing of Prestressing Material:
 - a. Provide mill certificates.
 - b. Prior to preparation of shop drawings and installation of vertical thread bars, provide proof that the thread bar anchorage system meets the requirements specified herein.
 - c. Before any prestressing operations may be started, the Tank Contractor shall calibrate all recording equipment at an approved testing laboratory to the satisfaction of the Engineer.

- d. All continuous force readings for either the vertical or the circumferential prestressing operations shall be developed with electronic (or the substantial equivalent) force (strain gauge method) sensing transducers, all having a maximum nonlinearity error of +/- 0.5 percent and a maximum hysteresis error of +/- 0.25 percent.
5. Anchor pockets for vertical thread bars:
 - a. Consist of steel cans fabricated from steel tubing, hot-dip galvanized after cutting and subsequently welded to the top bearing plate.
 - b. Provide adequate means for flushing of vertical ducts during concrete placement.
6. Ducts for vertical thread bars:
 - a. Duct enclosures shall be standard 1.25-inch or 1.375-inch diameter PVC pipe class 160 or class 200, respectively, unless otherwise specified on the Drawings.
 - b. Threaded hose connections shall be provided at the top of each duct for water flushing.
 - c. All ducts shall be provided with expandable valves to facilitate the injection of epoxy grout after prestressing.
7. Epoxy grout for vertical thread bars:
 - a. The vertical thread bar system shall offer complete two-part epoxy protection of the prestressing steel inside ducting and anchors.
 - b. Portland cement grout will not be accepted.

E. Seismic Cables and Sleeves:

1. Seismic cables:
 - a. Hot-dipped galvanized seven-wire strand:
 - b. Prestressing strand shall be in accordance with ASTM A 416 prior to galvanizing and ASTM A 475 after galvanizing.
 - c. Individually hot-dip galvanize each wire of strand before forming the wires into a strand.
 - d. The galvanized strand shall have a minimum ultimate tensile strength of 240,000 psi.
 - e. The cables shall be installed to connect the wall and the foundation.
 - f. The minimum weight of zinc galvanic coating shall be 0.85 ounces per square foot.
 - g. Only seven-wire strand will be allowed. Single wire will not be allowed.
2. Neoprene sleeves for seismic cables shall conform to SCE-43 of ASTM D 1056 and as further modified by the following:

Physical Characteristics	Required Results
Compressive deflection	9 to 13 psi
Shore 00 durometer	60 to 80 pcf
Density	12 to 28 pcf
Water absorption by weight	5 percent
Temperature range: Low (flex without cracking)	-40 degrees Fahrenheit
High continuous	150 degrees Fahrenheit
High intermittent	250 degrees Fahrenheit
Compressive set (average): 1/2-inch sample compressed at 50 percent for 22 hours at 70 degrees Fahrenheit and 24 hour recovery	15 to 35 percent

Physical Characteristics	Required Results
Maximum linear shrinkage during heat aging (7 days at 158 degrees Fahrenheit)	5 percent
Minimum tensile strength	175 psi
Minimum elongation	180 percent
Resilience (bayshore – percent rebound average 1/2-inch thickness at 72 degrees Fahrenheit)	20 to 40 percent

F. Shotcrete:

1. General:
 - a. Shotcrete shall conform to ACI 506.2, except as modified herein.
 - b. Minimum compressive strength of shotcrete shall be 4,500 psi at 28 days.
 - c. Shotcrete used in the tank construction shall have a maximum water soluble chloride ion concentration of 0.06 percent by weight of cement.
 - d. Rebound materials shall not be reused in any form for shotcrete.
2. Portland cement shall meet the general requirements in Section 03300.
3. Fine aggregates:
 - a. Fine aggregates shall meet the requirements as specified in Section 03300 and the following paragraphs.
 - b. Coarse sand:
 - 1) Shotcrete applications: Use well graded coarse sand, unless otherwise noted.
 - 2) Gradations:

Sieve Size	Percent Passing by Weight
3/8 inch	100
Number 4	95-100
Number 8	80-100
Number 16	50-85
Number 30	25-60
Number 50	10-30
Number 100	2-10

- c. Fineness modulus shall be between 2.7 and 3.0.
4. Water shall be in accordance with Section 03300.
5. Class F fly ash shall conform to ASTM C618 and shall not make up more than 20 percent of the cementitious material in the shotcrete mix.

G. Elastomeric Materials:

1. Bearing pads shall be natural rubber or neoprene:
 - a. Natural rubber bearing pads shall contain only virgin natural polyisoprene as the raw polymer and the physical properties shall comply with ASTM D 2000 Line Call-Out M4AA414A13.
 - b. Neoprene bearing pads shall have a hardness of 40 to 50 durometer, a minimum tensile strength of 1,500 psi, a minimum elongation of 500 percent, and a maximum compressive set of 50 percent. Pads shall

meet the requirements of ASTM D 2000 Line Call-Out M2BC410 A14 B14 or 2 BC 415 A1 4 B14 for 40 durometer material.

2. Sponge filler shall be closed-cell neoprene or rubber conforming to ASTM D 1056, Type 2, Class A, and Grade 3. Compression deflection limited to 25 percent at two to five psi.

H. Waterstops:

1. Requirements:

- a. Material: Polyvinyl chloride.
- b. Size and type:
 - 1) Centered at construction joints in cast-in-place concrete: 6-inch flat ribbed type.
 - 2) At tank walls to tank wall-footing joints: 9-inch wide with 1-inch diameter hollow bulb ribbed type.
 - 3) Type not allowed: Dumbbell type.
- c. Physical characteristics:

Physical Characteristics	Test Method	Required Results
Specific Gravity	ASTM D 792	Not less than 1.3
Hardness	ASTM D 2240	70 to 90 Type A Shore durometer
Tensile Strength	ASTM D 638	Not less than 2,000 pounds per square inch
Ultimate Elongation	ASTM D 638	Not less than 300 percent
Alkali Extraction	CRD C 572	7 day weight change between minus 0.1 percent and plus 0.25 percent. Hardness change within 5 points.
Low Temperature Brittle Point	ASTM D 746	No sign of cracking or chipping at minus 35 degrees Fahrenheit
Water Absorption	ASTM D 570	24 hours, not more than 0.15 percent
Accelerated Extraction Tensile	CRD C 527	Not less than 1,600 pounds per square inch
Stiffness in Flexure	ASTM D 747	Not less than 600 pounds per square inch
Tear Resistance	ASTM D 624	225 pounds per square inch
Weight Requirements		
Thickness		3/8 inch
Center Bulb Outside Diameter		1 inch nominal
Allowable Tolerances		
Width		Plus or minus 3/16 inch
Thickness		Plus or minus 1/32 inch

d. Manufacturers: One of the following or equal:

- 1) Burke Concrete Accessories, Inc.

- 2) Greenstreak PVC Waterstops, Sika Corporation.
- 3) Kirkhill Rubber Company.
- 4) Williams Products, Inc.
- 5) Vinylex Corporation.

I. Tank Appurtenances:

1. General:
 - a. Provide and install all appurtenances as shown on the Drawings and as specified herein.
2. Piping:
 - a. Inlet: As indicated on the Drawings.
 - b. Outlet: As indicated on the Drawings.
 - c. Overflow piping and overflow cone: As indicated on the Drawings.
 - d. Drain piping: As indicated on the Drawings.
3. Pipe Supports:
 - a. Provide as required to adequately support piping under all load and operating conditions.
 - b. Refer to Section 15061.
4. Conduits:
 - a. As indicated on Drawings.
5. Conduit Supports:
 - a. Provide as required to adequately support conduits under all load and operating conditions.
 - b. Refer to Section 16070.
6. Ladders:
 - a. Conforming to all requirements of OSHA and as indicated on the Drawings.
 - 1) Provide brackets and fasteners required for support and secure mounting to tank structure.
 - 2) Rungs: solid bar stock.
 - 3) Welds: fillet or full penetration as appropriate to the condition.
 - 4) Fasteners Ladder bolts, concrete anchors, nuts, washers, and flush steel inserts: Type 316 stainless steel.
 - b. Interior:
 - 1) Materials: Type 304/304L stainless steel.
 - 2) Fall protection: Fall arrest device as specified in the following paragraphs. Material to match that of ladder. Provide removable center rail extension projecting at least 48 inches above top rung of ladder.
 - c. Exterior:
 - 1) Materials: As indicated on the Drawings.
 - 2) ~~Fall protection: Provide safety cage as indicated on the Drawings. Material to match that of the exterior ladder.~~ Fall protection: "Saf-T-Climb" as indicated on the Drawings^{AD3}.
 - 3) Anti-climb door: Per ladder manufacturer. Material to match that of the exterior ladder.
 - d. Horizontal lifeline fall protection system: As indicated on the Drawings.
 - e. Fall arrest device consisting of sliding/locking mechanism with safety belt and belt attachment to center climbing rail.
 - 1) Device material: Type 304 stainless steel.

- 2) Devices: To include following items, all fabricated of device material unless otherwise accepted by the Engineer:
 - a) Rails: Lengths as required.
 - b) Brackets: Complete with brackets necessary for attaching rail to ladders.
 - c) Removable rail extension: 48-inch long.
- 3) Sleeve assemblies and safety belts: 2.
- 4) Manufacturers: The following or equal:
 - a) Norton Company, Air Space Device Division, Cerritos, CA, Saf-T-Climb with SAF-T-NOTCH RAIL and SAF-T-LOCK SLEEVE.
7. Access hatches (through-roof access):
 - a. Sizes: Nominal size(s) as indicated on the Drawings.
 - b. Material and construction:
 - 1) Door leaf/leaves: Aluminum diamond pattern plate with reinforcement if required for spans provided.
 - 2) Frame: Minimum 1/4-inch thick, aluminum channel with anchor flange around perimeter.
 - 3) Door hardware: Equip doors with following:
 - a) Hinges: Minimum 2 heavy forged stainless steel hinges and pins for each leaf.
 - b) Operators, hold-open and handle: Spring operators and automatic hold-open arm with release handle for each leaf.
 - c) Lock: A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of one cover. In addition, the lock shall be a cylinder style with a threaded security cover plug.
 - d) Seals: Leaf seals shall be dust and water tight.
 - e) Drainage coupling: 1-1/2-inch coupling located in front right corner of frame. Drain shall be installed to drain to the exterior side of the tank, adjust curb height as required.
 - 4) Finish: Manufacturer's standard mill finish.
 - 5) Manufacturers: One of the following or equal:
 - a) Bilco Co., Type JD-AL.
 - b) Babcock-Davis Associates, Inc., Type AM or GT.
 - c) Nystrom, Inc.
8. Hinged manway(s) (through-wall access):
 - a. Sizes: Nominal clear opening size(s) as indicated on the Drawings.
 - b. Materials and construction:
 - 1) All Type 304 stainless steel components, unless otherwise accepted by the ENGINEER.
 - 2) Lock: Provide stainless steel padlocks on the hand wheel and yoke.
 - c. Manufacturers: The following or equal:
 - 1) Chase Associates, Edgecomb, Maine, CM-1.
9. Grating, Guardrail, and Miscellaneous Fabrications:
 - a. Refer to Section 05500.
 - b. Materials: As indicated on the Drawings.
10. Roof Ventilator:
 - a. Size: As required to meet the air flow design requirements, but not less than indicated on the Drawings.
 - b. Materials and construction:
 - 1) Aluminum components.
 - 2) Stainless steel anchors.

- 3) Flashing shall wrap over the edge of the concrete curb and extend down a minimum of 2 inches.
 - 4) 2-inch aluminum filters.
 - 5) Insect screens.
 - 6) 12-inch tall base.
 - 7) Fiberglass hood insulation.
 - c. Manufacturers: The following or equal:
 - 1) Greenheck Fabra Hood.
 - d. Finish: Manufacturer's standard mill finish.
- 11. Downspouts and conductor heads:
 - a. Minimum 22 gauge steel.
 - b. Galvanized in accordance with ASTM A 653 to G90 designation.
 - c. Fastened to the tank wall with stainless steel anchors.
 - d. Field painted. Color to be selected by Owner.
- J. Form ties:
 - 1. General: The requirements of this Section supplement the form ties requirements stated in Section 03102.
 - 2. Requirements:
 - a. Form ties for forming system selected for concrete other than corewall: Cone-snap tie or flat bar type with waterstops.
 - b. Form ties for forming system selected for tank corewall: Tapered ties.
- K. Wall Forms: As specified in Section 03102 SYMONS, ALUMA, and regular plywood forms may be used for forming of circular walls, as long as there are no straight sections longer than 36 inches at any place around the outside circumference of such walls.
 - 1. Forms shall be designed to resist the construction loads for full height wall pours.
- L. Polyethylene sheeting:
 - 1. Minimum 6-mils thick and in accordance with ASTM C 171.
- M. Granular leveling base:
 - 1. Material shall meet the requirements for aggregate base course specified in Section 02050.
- N. Epoxy injection materials: As specified in Section 03931 and the following products:
 - 1. Grout injection pipes: Provide with positive mechanical shutoff valves.
- O. Materials for repair of chipped out concrete areas:
 - 1. Epoxy bonding agent: As specified in Section 03071.
- P. Membrane Liner:
 - 1. Thickness: Minimum 30 mil.
 - 2. Material: Impermeable PVC.
 - 3. Manufacturers: One of the following or equal:
 - a. York Manufacturing, Inc., Wasco Seal.
 - b. Watersaver Co., Inc. equivalent product.
 - c. Palco Linings, Inc. equivalent product.
 - 4. Install liner per manufacturer's recommendations to provide a waterproof layer below the tank foundation as indicated on the Drawings.^{AD2}

2.02 SOURCE QUALITY CONTROL

- A. Concrete testing:
 - 1. As specified in Section 03300.

PART 3 EXECUTION

3.01 SUPERVISION

- A. The Tank Contractor shall provide a full-time on-site project manager during all aspects of tank construction.

3.02 INSTALLATION

- A. Waterstops:
 - 1. General: The requirements of this Section supersede the waterstop requirements stated in Section 03150.
 - 2. Requirements:
 - a. Install in concrete joints where indicated on the Drawings.
 - b. Connect the ends of the radial waterstop in the wall footing joints to the circumferential waterstop in the wall to wall footing joint and to the circumferential waterstops in the floor to wall-footing joints if they should exist.
 - c. Provide waterstop in each joint in water-bearing structures, whether indicated on the Drawings or not.
 - d. Provide waterstops that are continuous.
 - e. Set accurately to position and line indicated on the Drawings.
 - f. Hold and securely fix edges in position at intervals of not more than 12 inches and secure in manner that they cannot move during placing of concrete.
 - g. A hog-ring or nail may be driven through both ends of the waterstop to facilitate placing and tying of waterstops to reinforcing steel forms or form-ties.
 - h. Tank Contractor's option: One of the following:
 - 1) Use waterstop tie wires at not more than 12 inches on centers, near outer ribs, to tie waterstops into position.
 - 2) Use special clips.
 - i. Waterstop terminations: Terminate 3 inches from top of finished surfaces of walls and slabs unless otherwise specified or indicated on the Drawings.
 - j. Installation of waterstops:
 - 1) Install so that joints are watertight.
 - 2) Provide field welded polyvinyl chloride waterstop joints such as unions, crosses, ells, and tees.
 - 3) Make all splices to waterstop in accordance with manufacturer's recommendations.
 - 4) Clean waterstops of all concrete, dirt, and foreign matter.
- B. Form and accessories removal:
 - 1. General: The requirements of this Section supercede the form and accessories removal requirements stated in Section 03102.

2. Requirements:
 - a. Other forms supporting concrete and shoring: Remain in place as follows:
 - 1) Sides of footings, sides of slabs, and columns: 24 hours minimum.
 - 2) Core walls: 12 hours minimum.
- C. Neoprene bearing pads:
 1. General:
 - a. Secure bottom surface of pads by positive attachment to structure such that horizontal crawling is prevented.
- D. Closed cell neoprene joint fillers and sleeves ("sponge filler"):
 1. When joint filler pads or sponge filler sleeves are indicated on the Drawings or specified, place materials in correct position before concrete is placed against them.
 2. Holes and joints in pads are to be filled with caulking to prevent passage of mortar or concrete from one side of the joint to the other.

3.03 FLOOR

- A. Prior to placement of the floor reinforcing, a 6-mil polyethylene moisture barrier shall be placed over the leveling base material. Joints in the polyethylene shall be overlapped a minimum of six inches.
- B. Prior to placement of the floor concrete, all piping that penetrates the floor shall be set and encased in concrete to the limits indicated on the Drawings. Provide waterstops at the joints between the encasement and the concrete floor slab where indicated on the Drawings.
- C. The vertical waterstops between the wall and footing shall be placed and supported to locate the center bulb within the joint as indicated on the Drawings and as required by the Tank Contractor. The waterstop shall be spliced using a thermostatically controlled sealing iron and each splice shall be successfully spark tested prior to encasement in concrete.
- D. The floor shall be poured without construction joints, except as otherwise allowed by the Engineer. There shall be no construction joints between the floor and wall footing.

3.04 CONCRETE

- A. All concrete shall be conveyed, placed, finished, and cured as specified in Section 03300, except as modified herein.
- B. Requirements:
 1. Cold joints:
 - a. Cold joints in floors, dome, and wall footings are not allowed.
 - b. Continuously cover joints with new concrete, and thoroughly integrate through vibration, even if it means that horizontal passes of only 6 inches in width can be made until additional concrete and equipment becomes available to permit wider passes in concrete placement.
 2. Blockouts or other types of wall openings: Do not provide openings other than those indicated on the Drawings.

C. Weather Limitations:

1. Unless specifically authorized in writing by the Engineer, concrete shall not be placed without special protection during cold weather when the ambient temperature is below 35 degrees Fahrenheit and when the concrete is likely to be subjected to freezing temperatures before initial set has occurred and the concrete strength has reached 500 psi. Concrete shall be protected in accordance with ACI 306.1. The temperature of the concrete shall be maintained in accordance with the requirements of ACI 301 and ACI 306.1. All methods and equipment for heating and for protecting concrete in place shall be subject to the approval of the Engineer.
2. During hot weather, concreting shall be in accordance with the requirements of ACI 305.1.
3. Placement of concrete during periods of low humidity (below 50 percent) shall be avoided when feasible and economically possible, particularly when large surface areas are to be finished. In any event, surfaces exposed to drying wind shall be covered with polyethylene sheets immediately after finishing, or flooded with water, or shall be water cured continuously from the time the concrete has taken initial set. Curing compounds may be used in conjunction with water curing, provided they are compatible with coatings that may be applied later and if they are degradable.

D. Finishes:

1. Provide manufacturer's standard finish unless otherwise noted.

E. Curing:

1. Except where specified herein, concrete curing shall be as specified in Section 03300.
2. Requirements:
 - a. Any concrete surface that is designated to receive paint or upon which any material is to be bonded: No curing compound shall be used.
 - b. Concrete designated to be painted: Water or plastic membrane cure.
 - c. Tank core walls: Water curing.
 - d. Floor slab:
 - 1) The floor shall be cured by flooding with water, and shall remain saturated for a minimum of seven days after placement.
 - 2) Alternatively, the floor slab may be cured with a sprayed on curing compound and prepared as follows:
 - a) After the surface is dry to the touch, a 6-mil thick polyethylene sheet shall be carefully taped and sealed to the concrete surface and kept on such surface for as long as possible, but not less than 7 days, to minimize the loss of moisture trapped between the polyethylene sheet and the concrete.
 - b) Alternatively, heavy curing blankets may be used in lieu of the polyethylene sheet.
 - e. Dome: Water or plastic membrane cure.
 - f. Other concrete surfaces: Water curing.

F. Testing Cast-in-Place Concrete:

1. All concrete testing shall be in accordance with Section 03300, except as noted herein.
2. Testing shall be at the expense of the Owner as specified in Section 01455.

3.05 SEISMIC CABLES

A. Requirements:

1. Provide seismic cables to connect wall and wall footing.
2. Quantity and spacing of seismic cables shall be as indicated on the Shop Drawings.
3. Where necessary, seismic cables shall be pre-bent before placing units in wall and wall footing.
4. Tie seismic cables to lower horizontal circumferential tie-bar for vertical prestress tendons as indicated on the Drawings.
5. In wall-footing, tie seismic cables to radial footing bars.

3.06 PRESTRESSING

A. Circumferential Prestressing Equipment:

1. The circumferential stressing system shall produce a continuously, electronically (or substantial equivalent) monitored permanent stress or force recording along its full length as it is being applied and the stress variation in any strand at any point around the circumference shall not be greater than ± 1.5 percent of the ultimate strength of the steel. In addition to this recording, any system which deflects the tensioned prestressing material between the tensioning device and the wall after it has left the tensioning device, shall provide a similar continuously monitored stress or force record along its full length as it is being applied to the wall. These recordings shall show that either before or after deflection that the stress variation in the prestressing material at any point around the circumference shall not be greater than ± 1.5 percent of the ultimate strength of the steel.
2. Due to prior instances of force measurement inaccuracies and the inherent problems associated with hand-held stressometers, no manually recorded force readings will be accepted. This requirement shall be strictly followed.
3. Any wrapping that does not meet the stress tolerances specified and/or cannot meet the requirements of above will not be accepted and will be removed at the expense of the Tank Contractor. The Tank Contractor is responsible for all costs associated with meeting the specified tolerances.
4. Since intermittent force applications can result in an unequal stress distribution around the wall (due to friction losses), the prestressing system shall be capable of applying a continuous wrapped force at any point around the circumference within the specified tolerances. Circumferential stressing systems based on jack-operated cable or rod-type tendons (such as those placed inside of ducts incorporated in the corewall or placed manually around the exterior of the corewall) will not be allowed.
5. Since wrapping systems which utilize single solid prestressing material will not provide the desired bond between the prestressing material and the shotcrete and since single solid prestressing material will not provide an adequate safety factor against failure, only machine wrapping systems which utilize seven-wire prestressing strandwrapping will be allowed.

B. Circumferential Prestressing Application:

1. All cracks in the core wall and floor slab shall be repaired as specified following the circumferential prestressing of the tank walls.
2. Wrapped strand shall be anchored to the wall at least once for every coil or reel.

3. Permanently anchoring one strand to a previously wrapped strand will not be permitted. Wrapped strand ends shall be joined by suitable splicing methods that shall develop 90 percent of the full strength of the strand.
4. Use of different alloys in the splicing material shall not be permitted.
5. The clear vertical spacing between any two wrapped strands shall be 1.5 strand diameters or 3/8-inch, whichever is larger. A 1/4-inch construction tolerance shall apply to strand spacing, as well as to this minimum spacing requirement.
6. All wrapped strand not meeting the spacing requirements shall be spread by approved methods or shall otherwise be removed.

C. Vertical Prestressing Equipment:

1. The Tank Contractor shall provide a continuously, electronically (or substantial equivalent), monitored permanent force elongation record from zero to full force at the final lock-off for all of the vertical prestressing work.
2. The ordinate of the permanent recording shall show the elongation in inches and the abscissa shall show the force in pounds or kips.
3. Manually recorded force and elongation readings will not be accepted.
4. The vertical prestressing machinery shall have automatic electronic tensioning cut-off devices or equivalent means to ensure that the specified force and elongation is not exceeded at any time during any thread bar stressing operation.
5. The force readings at the stressed bar ends, immediately after lock-off, for any stressing operation, on any thread bar, shall not fluctuate more than +/- 1.5 percent (of the minimum ultimate strength of the steel) from the desired average force setting.
6. The applied force, immediately after lock-off for the final stressing operation on any thread bar, shall be no less than 72 percent of the ultimate strength of the steel and the applied force before lock-off shall be no greater than 75 percent of the ultimate strength of the steel.

D. Vertical Prestressing Application:

1. All permanent anchor hardware shall have a ball-shaped threaded nut that can be screwed down on to a matching cone-shaped bearing surface in the bearing plate after the desired tension on the anchor hardware and/or prestressing steel has been applied.
2. The number and spacing of the thread bars shall not be altered under any condition.
3. High-strength thread bars shall be used for vertical prestressing.
4. All ducts shall be clean and free of water and deleterious materials that would impair bonding of the grout or interfere with grouting procedures.
5. Grout injection pipes shall be fitted with positive mechanical shutoff valves, which shall not be removed within the first 24 hours.
6. Grouting of thread bars shall begin at the lowest grout connection.
7. Each vertical thread bar duct shall be pumped until the entire nut at the top anchor has been covered with epoxy.
8. In cold weather, and especially during frosts, special precautions must be taken to avoid the freezing of grout. In the event that the grouting procedure cannot be postponed, the wall temperature must be kept above the freezing point with hot blankets or by other approved means.
9. Upon completion of the vertical stressing and grouting operation, all anchor pocket areas above the anchor nuts shall be dry packed with a 1 part cement

to 2 parts sand mortar mix immediately after the epoxy coating on the inside can surface has become tacky, or alternatively, the metal can may be filled with concrete aggregates and epoxy.

10. The inside surfaces of any metal cans to be dry packed shall be coated with a 2 part epoxy. Dry packing shall not proceed until the epoxy coat has become tacky. The dry pack surface shall be finished flush with the adjoining concrete surface.
11. Damaged PVC tubing shall be replaced unless repairs are made and approved by the Engineer.
12. Vertical thread bar components shall be assembled off the ground and as detailed on the Shop Drawings. All vertical thread bars must be fully assembled before they are installed in the forms.
13. Vertical thread bars shall be accurately placed and fastened securely in place to reinforcing steel and form ties to prevent movement during placement of concrete.
14. All vertical thread bars must be flushed with water from the top immediately upon completion of the concrete vibrating operation. Water shall be introduced through a taped-off hole in the wooden lids on the anchor pockets and be permitted to drain through the bottom grout tube. Flushing shall not be accomplished by introducing water through the bottom connection. Should a thread bar duct not flush properly, the Engineer shall be notified immediately.
15. Cleaning of ducts with air only (not water), or removal of water with air from the bottom connection, will not be permitted.
16. Placing of vertical thread bars shall be done to proper locations, elevations, and alignments, with a maximum tolerance of plus or minus 1/4 inch.
17. All vertical thread bars shall be properly tied at the anchor plates and shall be tied with No. 4 bars at intervals of 24 inches or less between the anchor plates. The maximum permissible misalignment of the anchor plate to the vertical thread bar is +/- 2.5 degrees.
18. Anchor plates must be installed at right angles to the thread bar alignment near the anchor. Anchor plates must be installed with long sides, aligned parallel with the wall forms and secured to prevent their rotation while concrete is placed.
19. Unless indicated otherwise on the Plans, the minimum concrete cover around steel anchor pockets and bearing plates shall be 1.5 inches.
20. The vertical clearance between bottom anchor plate and the waterstop at the base of the tank walls shall be no less than 2 inches nor more than 4 inches.

E. Circumferential and Vertical Prestressing Operations:

1. The maximum initial electronically recorded steel stress shall not exceed 75 percent of the guaranteed minimum ultimate strength of the steel at any time during or after stressing.
2. An automatic, continuously electronically (or substantial equivalent) monitored permanent recording of the applied force, at any point on the strand, at any point on and around the tank wall, must be made during the entire circumferential prestressing application. All such recordings must be based on a continuous sensing of the applied force on the strand between the tensioning drum and the wall when, and as, the strand is being wrapped and laid on the wall.
3. The force setting on wrapping and vertical thread bar stressing machinery shall be such that the applied forces fall within the specified minimum or maximum stress or force limitations; the force setting shall be corrected

immediately when the applied force falls outside the required force tolerance limitations.

4. In the event that the stressing machinery is incapable of holding the applied forces within the specified stress or force limitations, the Engineer will order, at the expense of the Tank Contractor, the removal and replacement of such machinery in favor of a different unit capable of maintaining such tolerance requirements.
5. The loss in stress in post-tensioned prestressing steel due to creep and shrinkage of concrete and sequence stressing is to be assumed as 25,000 psi. The final stress is the average initial stress reduced by the stress loss of 25,000 psi.
6. The final force is the steel section multiplied by the final stress.
7. The final force for the vertical thread bars shall be no less than the required final force shown on the Shop Drawings.
8. The initial force for the circumferential wrapped strand shall be no less than the required initial force shown on the Shop Drawings.
9. The continuous, electronically-produced force application chart during the wrapping application becomes the property of the Owner.
10. An automatic, continuously electronically (or substantial equivalent) monitored and simultaneously recorded force-elongation reading must be made for each vertical stressing application.
11. The force-elongation reading must represent the true relationship between the elongation at any given point of the vertical stressing operation and the applied force on the prestressing steel at that same point.
12. The force-elongation relationship must be constantly maintained from the beginning, starting with the removal of the slack to the point of lock-off and complete release of the force on the vertical prestressing steel after retraction of the stressing piston or equivalent stressing device.
13. All electronically produced force-elongation readings during the vertical thread bar stressing operations become the property of the Owner.
14. After the concrete core wall has reached the specified 28-day compressive strength, the vertical thread bars shall be stressed.
15. Circumferential wrapping shall not start until the vertical thread bars have been stressed.
16. In the event gaps between concrete core wall and wrapped strand develop that exceed 3/8 inch, discontinue wrapping. Before resuming any wrapping, either:
 - a. Build-up walls with shotcrete to provide proper curvature before resuming any wrapping.
 - b. If acceptable to Engineer, drypack gaps after wrapping is completed and before shotcreting is started.
17. Wrapping over intermediate shotcrete coats or built-up shotcrete areas may commence 12 hours after shotcrete has been applied, or when the shotcrete has reached a strength of 250 psi, whichever duration is longest.
18. Prestressing strand exposed to excessive temperatures greatly increases the possibility of irrevocable damage to the strand such as steel embrittlement, stress corrosion, and strand splitting. The temperature of the prestressed strand during wrapping shall not be allowed to increase by more than 50 degrees at any time during application due to stressing technique.
19. All vertical thread bar ducting and anchors (both vertical and circumferential prestressing) shall be pressure grouted with an approved 2 part water insensitive epoxy and approved epoxy grouting equipment.

3.07 ABRASIVE BLASTING

- A. Exterior surfaces of concrete walls shall be prepared prior to the commencement of any shotcreting or strand wrapping, to remove all deteriorated concrete and bond-inhibiting contaminants. The surface preparation shall achieve a minimum profile of International Concrete Repair Institute (ICRI) CSP5 over a minimum of 90 percent of the surface area required to be prepared. The prestressing operator who is performing the abrasive blasting shall make available to the inspector an ICRI surface preparation sample to assist with evaluation of the surface preparation.
- B. The concrete surface shall have no traces of laitance, form-oil, original surface smoothness, or surface color.
- C. In order to mitigate environmental concerns, conform to environmental constraints, and achieve the desired profile, the Tank Contractor shall utilize either a self-contained mechanical etching or shot blast system, combined with a vacuum recovery system, or a high pressure water jetting system. Abrasive blasting systems which rely on sandblasting or steel shot without a vacuum recovery system, or systems that have not been used successfully in the past to prepare surfaces for shotcreting and standwrapping, will not be permitted.

3.08 SHOTCRETING

- A. Shotcrete Equipment:
 - 1. Shotcrete mixing shall be in conformance with the requirements of Section 03300.
 - 2. The delivery equipment shall be of an approved design and size that has given satisfactory results in similar previous work.
 - 3. The equipment must be capable of discharging mixed materials into the hose under close control and it must be able to deliver a continuous smooth stream of uniformly mixed material at the proper velocity to the discharge nozzle, free from slugs of any kind.
 - 4. The nozzle shall be of a design and size that will insure a smooth and uninterrupted flow of materials.
 - 5. Delivery equipment shall be thoroughly cleaned at the end of each shift.
 - 6. Equipment parts shall be regularly inspected and replaced as required.
 - 7. The capacity of the compressor shall be large enough that the minimum amount of air to be available at the nozzle shall be no less than 400 cfm, irrespective of whether or not air from the same air supply is used for other purposes.
- B. Placement and Testing of Shotcrete:
 - 1. Shotcrete shall be applied by an ACI 506 certified nozzleman.
 - 2. Manually applied shotcrete shall be applied with the nozzle held at a small upward angle not exceeding five degrees and constantly moving during application in a smooth motion with the nozzle pointing in a radial direction toward the center of the tank. The nozzle distance from the prestressing shall be such that shotcrete does not build up or cover the front face of the wire or strand until the spaces behind and between the prestressing elements are filled.
 - 3. Unless applied by an automated shotcrete process, total cover coat thickness shall be controlled by shooting guide wires. Vertical wires shall be installed

under tension and spaced no more than two feet apart to establish uniform and correct coating thickness. Monofilament line (100 lb. test) or 18 or 20 gauge high tensile strength steel wire shall be used. Guide wires shall be removed after placement of the cover coat.

4. Shotcrete applied by an automated shotcrete process shall be applied using the wet mix only. Nozzles shall be kept mounted on power driven machinery enabling the nozzle to travel parallel to the surface to be sprayed at a uniform linear or bi-directional speed. The nozzle shall be kept at a uniform constant distance from the surface, always maintaining a right angle spray of the material to the surface. The high velocity impact shall be developed pneumatically by injecting compressed air at the nozzle.
5. Testing:
 - a. Testing shall be by an independent testing laboratory, acceptable to Engineer, and engaged by and at the expense of the Tank Contractor.
 - b. Test shotcrete in accordance with ACI 506, except as specified herein. One test panel shall be made for each of the following operations: core wall, cove, wire cover, and cover coat. Test panels shall be made from the shotcrete as it is being placed, and shall, as nearly as possible, represent the material being applied. The method of making a test sample shall be as follows: A frame of wire fabric (one foot square, three inches in depth) shall be secured to a plywood panel and hung or placed in the location where shotcrete is being placed. This form shall be filled in layers simultaneously with the nearby application. After 24 hours, the fabric and plywood backup shall be removed and the sample slab placed in a safe location at the site.
 - c. The sample slab shall be moist cured in a manner identical to that used for the regular surface application. The sample slab shall be sent to the testing laboratory. Nine three-inch cubes shall be cut from the sample slab and subjected to compression tests in accordance with current ASTM Standards. Three cubes shall be tested at the age of 7 days, three shall be tested at the age of 28 days, and three shall be retained as spares.

C. Shotcrete Placing and Finishing:

1. Shotcrete shall be applied in a steady, uninterrupted flow. Should the flow become intermittent for any cause, the machine operator shall direct the nozzle away from the work until it again becomes constant, or shut off the flow of materials.
2. The nozzle shall be held at approximately right angles to the surface and shall be kept at the proper and the same distance from the surface dictated by good practice standards for the type of application, type of nozzle and air pressure employed.
3. Sufficient time shall be allowed for each layer of shotcrete to set up so it may take the next layer without sagging.
4. The shotcrete shall be started at the bottom of the wall until all wrapped strand has been covered. Subsequent shotcrete layers may be applied from the top down or from the bottom up at the discretion of the Tank Contractor.
5. While the nozzle travels around the wall, the nozzle shall be raised or lowered at a uniform rate in such a manner that an adequate overlapping of coatings and a uniform finish will develop.
6. The nozzle shall be spiraled up or down around the tank to either the top or the bottom of the wall or to the termination of the intermediate strand layer.

7. To ensure proper penetration around the strand and proper conveyance of the material through the hose, a 5 to 7-inch slump of the mortar at the pump is recommended.
8. The application of the shotcrete in the number and thickness of layers specified herein is mandatory for proper penetration of shotcrete behind prestressing material and to reduce shrinkage due to more uniform in-depth drying of the shotcrete.
9. Each layer of wrapped prestressing steel shall be covered with shotcrete until a minimum clear cover of 3/8-inch or the diameter of the strand, whichever is greater, has been placed over the prestressing steel.
10. The final cover coat, to make up for the full thickness of shotcrete over the final strand layer, shall be applied in at least 3 layers of equal thickness.
11. Each layer of shotcrete shall be completed for the full circumference of the tank and substantially the full height of that layer before the next layer of shotcrete may be applied.
12. All shotcrete coatings shall be built up in layers of approximately 3/8-inch in thickness until the final required thickness has been obtained. The Tank Contractor shall demonstrate by a reliable means that the proper thickness of shotcrete has been obtained with each layer applied.
13. Unless otherwise specified on the Drawings, the minimum shotcrete cover over all wrapped steel shall not be less than the following:
 - a. For shotcrete in contact with soil: 2 inches.
 - b. For other shotcrete exposures: 2 inches.
14. The Tank Contractor shall make provisions to protect adjacent structures, equipment, vehicles, etc., from being damaged by overshooting shotcrete and rebound materials. Overshot shotcrete deposited onto the dome shall be removed before it adheres to the concrete surface.
15. After the minimum shotcrete cover specified over the wrapped prestressing strand has been completed by the automated shotcrete procedure, and if such finish requirements are shown on the Drawings, the exterior surface shall be given an acceptable float finish true to line and curvature and to details shown on the Drawings.
16. If a float finish is required on the Drawings, plaster or hand-applied shotcrete may be used to build up and level the surface and to obtain the desired surface finish and projections.
17. The finish coat mix (if a smooth float finish is required on the Drawings), shall consist of a minimum of one sack of cement for each 3-1/2 cubic feet of moist plaster sand.
18. The Tank Contractor shall be responsible for all damages caused by shotcreting operations and shall bare the cost for making repairs.

D. Hand Placed Shotcrete for Repairs Only:

1. To ensure a high quality shotcrete, the Tank Contractor shall satisfy the Engineer that the nozzleman has had sufficient and acceptable experience in the application of structural shotcrete and is a certified nozzleman in accordance with ACI 506.
2. Experience gained on shotcrete pool and ditch construction will not be considered as experience for qualifying the nozzleman.
3. The nozzleman shall be capable of applying thin coats of even and uniform thickness.
4. The nozzleman's skill shall be tested and the results of such tests shall be acceptable to the Engineer before that nozzleman may start any work.

- E. Restrictions on Shotcrete Operation:
1. Shotcrete shall not be applied under such strong wind conditions that a considerable amount of cement and moisture will be removed by the wind from the mortar spray between the nozzle and the surface on which the shotcrete is applied.
 2. Shotcrete may be applied in cold weather provided the surfaces are not frozen.
 3. The temperature during the day must be expected to rise to at least 40 degrees Fahrenheit and the night temperature of the first night after the shotcrete application must not be expected to drop below 27 degrees Fahrenheit.
 4. The use of Type 3 Portland cement is required (when readily available) in the event shotcrete is applied at temperatures below 40 degrees Fahrenheit.
 5. The Tank Contractor may apply shotcrete under the conditions specified herein solely at his own risk.
 6. Whenever rain or frost has damaged shotcrete which has not had a chance to set up, such shotcrete must be removed and replaced.
 7. The Tank Contractor shall consult with the Engineer to determine whether or not he will accept the shotcrete damaged by rain or frost before applying any new layers of shotcrete.
- F. Shotcrete Curing:
1. Intermediate layers of shotcrete shall be kept damp by hand curing or other means no sooner than 12 hours after the shotcrete has been applied.
 2. Watercuring is not required should additional shotcrete be applied on the entire wall surface within the following 12 hours.
 3. Indiscriminate use of continuous watercure for intermediate layers should be avoided.
 4. Complete shotcrete surfaces, which do not receive any additional shotcrete coatings, shall be membrane cured with plastic for a period of at least seven (7) days. Plastic membrane used shall contain and prevent loss of moisture from shotcrete as much as possible. Membrane curing methods utilizing curing compounds or wax-based residuals will not be permitted.

3.09 CLEANING

- A. After construction is completed, the interior of the tank shall be completely cleaned of debris and flushed with clean water to remove all dirt and loose material.

3.10 NOT USED

3.11 FILLING AND WATERTIGHTNESS TESTING

- A. Filling:
1. The water used for the first filling of the tank will be furnished by the Owner. If the leakage test fails, the Tank Contractor shall refill the tank and retest it. The Tank Contractor shall be responsible for the cost of refilling the tank for subsequent tests.
 2. The tank shall be filled in approximately 8-foot increments with 8 working hours between each increment for observation of possible leaks through ring drains, wall, and wall-footing.

- B. Testing:
1. If only damp spots and small puddles of water are observed during filling, the filling of tank can continue. If leaks that are large enough to potentially fail the leakage test specified in Section 01759 are observed, the filling process shall cease, and those leaks shall be thoroughly investigated prior to continuing to fill the tank.
 2. Fill tank with water and hold water level at 3 inches below the overflow level for a period of 24 hours.
 3. Test tank for leakage in accordance with the provisions of Section 01759.
 4. Examine the tank and soil at the perimeter of the tank footings for evidence of leaks.
 - a. Acceptance criteria shall be as specified in Section 01759.
- C. Repairing tank leaks:
1. Repair leaks to satisfaction of the Engineer.
 2. Any areas that, in opinion of the Engineer, are exposed to contamination during repair work shall be sprayed with disinfection water mix.
 3. Leakage through joints, which may have resulted from bent over waterstops or honeycomb under or around waterstops, may require removal of concrete around waterstops in suspected areas.
 4. Repair of chipped out concrete areas:
 - a. Coat chipped out concrete surface with epoxy bonding agent.
 - b. Properly drypack with drypack mix for repair of concrete tank areas.
 5. Any cracks, voids, honeycomb, or cold joints showing or causing running leaks of water, shall be repaired by epoxy injection as specified in Section 03931 until such cracks and voids have been completely sealed.

END OF SECTION

^{AD2} Addendum No. 2

^{AD3} Addendum No. 3

SECTION 15052

COMMON WORK RESULTS FOR GENERAL PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Basic materials and methods for metallic and plastic piping systems.

1.02 REFERENCES

- A. American Society of Mechanical Engineers (ASME):
 - 1. B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through 24.
 - 2. B16.47 - Large Diameter Steel Flanges: NPS 26 Through NPS 60 Metric/Inch Standard.
- B. American Water Work Association (AWWA):
 - 1. C11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe.
 - 2. C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - 3. C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 4. C151 - Ductile-Iron Pipe, Centrifugally Cast.
 - 5. C207 - Standard for Steel Pipe Flanges for Waterworks Services-Size 4 Inch Through 144 Inch.
- C. ASTM International (ASTM):
 - 1. A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
 - 2. A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
 - 3. A194 - Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
 - 4. A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
 - 5. A563 - Standard Specification for Carbon and Alloy Steel Nuts.
 - 6. B88 - Standard Specification for Seamless Copper Water Tube.
 - 7. D2000 - Standard Classification System for Rubber Products in Automotive Applications.
 - 8. D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing and Fittings.
 - 9. F37 - Standard Test Methods for Sealability of Gasket Materials.
 - 10. F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - 11. F594 - Standard Specification for Stainless Steel Nuts.
 - 12. F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements of Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.

- D. California Health and Safety Code.
- E. NSF International (NSF):
 - 1. 61 – Drinking Water System Components – Health Effects.

1.03 DEFINITIONS

- A. Buried pipes: Pipes that are buried in the soil with or without a concrete pipe encasement.
- B. Exposed pipe: Pipes that are located above ground, or located inside a structure, supported by a structure, or cast into a concrete structure.
- C. Underground pipes: Buried pipes - see A. above.
- D. Underwater pipes: Pipes below the top of walls in basins or tanks containing water.
- E. Wet wall: A wall with water on at least 1 side.

PART 2 PRODUCTS

2.01 GENERAL

- A. Materials as specified in Section 01600 - Product Requirements including special requirements for materials in contact with drinking water.

2.02 LINK TYPE SEALS

- A. Characteristics:
 - 1. Modular mechanical type, consisting of interlocking neoprene or synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening.
 - 2. Links to form a continuous rubber belt around the pipe.
 - 3. Provide a nylon polymer pressure plate with Type 316 stainless steel hardware. Isolate pressure plate from contact with wall sleeve.
 - 4. Hardware to be Type 316 stainless steel.
 - a. Provide anti-galling lubricant for threads.
- B. One of the following or equal:
 - 1. Link-Seal.
 - 2. Pipe Linx.

2.03 FLANGE BOLTS AND NUTS

- A. General:
 - 1. Washer:
 - a. Provide a washer for each nut.
 - b. Washer shall be of the same material as the nut.
 - 2. Nuts: Heavy hex-head.
 - 3. Cut and finish flange bolts to project:
 - a. Face of the bolt shall exceed face of nut by 1/16th-inch minimum.
 - b. A maximum of 1/4-inch beyond outside face of nut after assembly.

4. Tap holes for cap screws or stud bolts when used.
5. Lubricant for stainless steel bolts and nuts:
 - a. Chloride-free.
 - b. Manufacturers: One of the following or equal:
 - 1) Huskey FG-1800 Anti-Seize.
 - 2) Weicon Anti-Seize High-Tech.

B. Ductile iron pipe:

1. On exposed pipes with pressures equal to or less than 150 pounds per square inch gauge (psig):
 - a. Bolts: In accordance with ASTM A307, Grade B.
 - b. Nuts: In accordance with ASTM A563, Grade A.
 - c. Bolts and Nuts: Hot-dip galvanized in accordance with ASTM F2329.
2. On exposed pipes with pressures greater than 150 psig:
 - a. Bolts: In accordance with ASTM A193, Grade B.
 - b. Nuts: In accordance with ASTM A194, Grade 2H.
 - c. Bolts and nuts: Hot-dip galvanized in accordance with ASTM F2329.
3. On underwater pipes and pipes adjacent to wet walls:
 - a. Bolts: In accordance with ASTM A193, Grade B8M.
 - b. Nuts: In accordance with ASTM A194, Grade 8M.
4. On buried pipes:
 - a. Bolts: In accordance with ASTM A193, Grade B8M.
 - b. Nuts: In accordance with ASTM A194, Grade 8M for nuts.

C. Steel pipe:

1. On exposed pipes:
 - a. For ASME B16.5 Class 150 flanges and AWWA C207 Class D flanges:
 - 1) Bolts: In accordance with ASTM A307, Grade B.
 - 2) Nuts: In accordance with ASTM A563, Grade A.
 - 3) Bolts and Nuts: Hot-dip galvanized in accordance with ASTM F2329.
 - b. For ASME B16.5 and B16.47 Class 300 flanges and AWWA C207 Class E and F flanges:
 - 1) Bolts: In accordance with ASTM A193, Grade B7.
 - 2) Nuts: In accordance with ASTM A194, Grade 2H.
2. On underwater pipes and pipes adjacent to wet walls:
 - a. Bolts: In accordance with ASTM A193, Grade B8M.
 - b. Nuts: In accordance with ASTM A194, Grade 8M.
3. Low-temperature service: Stainless steel, Type 316:
 - a. Bolts: In accordance with ASTM A320, Grade B8M, Class 1, heavy hex.
 - b. Nuts: In accordance with ASTM A194, Grade B8M, heavy hex.
 - c. Washers: Alloy group matching bolts and nuts.
4. High-temperature service or high-pressure service: Stainless steel, Type 316:
 - a. Bolts: In accordance with ASTM A193, Grade B8M, Class 1, heavy hex.
 - b. Nuts: In accordance with ASTM A194, Grade 8, heavy hex.
 - c. Washers: Alloy group matching bolts and nuts.

2.04 MECHANICAL JOINTS BOLTS AND NUTS

A. Bolts including T-Bolts:

1. High strength low alloy steel in accordance with AWWA C111.
2. Type 304 stainless steel in accordance with ASTM F593.
3. Type 316 stainless steel in accordance with ASTM F593.

- B. Heavy Hex Nuts:
 - 1. High strength low alloy steel in accordance with AWWA C111.
 - 2. Type 304 stainless steel in accordance with ASTM F594.
 - 3. Type 316 stainless steel in accordance with ASTM F594.

2.05 GASKETS

- A. General.
 - 1. Gaskets shall be suitable for the specific fluids, pressure, and temperature conditions.
 - 2. Capable of being applied on surface of piping with cavities to provide for an improved seal with the internal piping pressure.
- B. Gaskets for flanged joints in ductile iron or steel water piping:
 - 1. Suitable for hot or cold water, pressures equal to and less than 150 pounds per square inch gauge, and temperatures equal to and less than 160 degrees Fahrenheit.
 - 2. Material:
 - a. SBR or neoprene elastomer, compressed, with non-asbestos fiber reinforcement.
 - 3. Manufacturers: One of the following or equal:
 - a. Garlock, Bluegard 3300.
 - b. John Crane, similar product.
- C. Gaskets for flanged joints in ductile iron or steel drinking water piping meeting NSF requirements:
 - 1. Suitable for hot or cold water, pressures equal to or less than 150 pounds per square inch gauge, and temperatures equal to or less than 160 degrees Fahrenheit.
 - 2. Material:
 - a. EPDM material with 80 Shore A durometer rating.
 - 3. Manufacturers: One of the following or equal:
 - a. Garlock, 98206.
 - b. John Crane, similar product.
- D. Gaskets for mechanical joints in ductile iron:
 - 1. Certified to NSF-61 when used for potable water service.
 - a. SBR or NBR.
- E. Gaskets for push-on rubber gasket joints in ductile iron:
 - 1. Certified to NSF-61 when used for potable water service.
 - a. SBR or NBR.

2.06 REPAIR BANDS

- A. Design requirements:
 - 1. In accordance with AWWA C230.
- B. Materials:
 - 1. Shells: Type 304 stainless steel.
 - 2. Lugs: Removable epoxy coated ductile iron in accordance with ASTM A536.

3. Bolts and nuts: 304 Stainless Steel with fluoropolymer coated nuts.
 4. Gaskets: Compounded for water and sewer service.
- C. Manufacturers: One of the following or equal:
1. Romac Industries, Inc.
 2. Smith-Blair Inc.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General:
1. Piping drawings:
 - a. Except in details, piping is indicated diagrammatically. Not every offset and fitting, or structural difficulty that may be encountered has been indicated on the Drawings. Sizes and locations are indicated on the Drawings.
 - b. Perform minor modifications to piping alignment where necessary to avoid structural, mechanical, or other type of obstructions that cannot be removed or changed.
 - 1) Modifications are intended to be of minor scope, not involving a change to the design concept or a change to the Contract Price or Contract Times.
 2. Piping alternatives:
 - a. Provide piping as specified in this Section, unless indicated on the Drawings or specified otherwise.
 - b. Alternative pipe ratings:
 - 1) Piping with greater pressure rating than specified may be substituted in lieu of specified piping without changes to the Contract Price.
 - 2) Piping of different material may not be substituted in lieu of specified piping.
 - c. Valves in piping sections: Capable of withstanding specified test pressures for piping sections and fabricated with ends to fit piping.
 - d. Flanged joints: where 1 of the joining flanges is raised face type, provide a matching raised face type flange for the other joining flange.
 3. Unless otherwise indicated on the Drawings, piping at pipe joints, fittings, couplings, and equipment shall be installed without rotation, angular deflection, vertical offset, or horizontal offset.
- B. Wall and slab penetrations:
1. Provide sleeves for piping penetrations through aboveground masonry and concrete walls, floors, ceilings, roofs, unless specified or otherwise indicated on the Drawings.
 2. For piping 1 inch in nominal diameter and larger, provide sleeves with minimum inside diameters of 1 inch plus outside diameter of piping. For piping smaller than 1 inch in nominal diameter, provide sleeve of minimum twice the outside diameter of piping.
 - a. Arrange sleeves and adjacent joints so piping can be pulled out of sleeves and replaced without disturbing the structure.
 - b. Cut ends of sleeves flush with surfaces of concrete, masonry, or plaster.

- c. Conceal ends of sleeves with escutcheons where piping runs through floors, walls, or ceilings of finished spaces within buildings.
 - d. Seal spaces between pipes and sleeves with link-type seals when not otherwise specified or indicated on the Drawings.
 - 3. Provide flexibility in piping connecting to structures to accommodate movement due to soil settlement and earthquakes. Provide flexibility using details indicated on the Drawings.
 - 4. Core drilled openings:
 - a. Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the existing concrete without acceptance by Engineer.
 - b. Determine location of reinforcing bars or other obstructions with a non-destructive indicator device.
 - c. Remove dust and debris from hole using compressed air.
- C. Exposed piping:
 - 1. Install exposed piping in straight runs parallel to the axes of structures, unless otherwise indicated on the Drawings:
 - a. Install piping runs plumb and level, unless otherwise indicated on the Drawings.
 - 1) Slope plumbing drain piping with a minimum of 1/4-inch per foot downward in the direction of flow.
 - 2. Install exposed piping after installing equipment and after piping and fitting locations have been determined.
 - 3. Support piping: As specified in Sections 15061 - Pipe Supports and 15062 - Preformed Channel Pipe Support System:
 - a. Do not transfer pipe loads and strain to equipment.
 - 4. In addition to the joints indicated on the Drawings, provide unions, flexible couplings, flanged joints, flanged coupling adapters, and other types of joints or means which are compatible with and suitable for the piping system, and necessary to allow ready assembly and disassembly of the piping.
 - 5. Assemble piping without distortion or stresses caused by misalignment:
 - a. Match and properly orient flanges, unions, flexible couplings, and other connections.
 - b. Do not subject piping to bending or other undue stresses when fitting piping.
 - c. Do not correct defective orientation or alignment by distorting flanged joints or subjecting flange bolts to bending or other undue stresses.
 - d. Flange bolts, union halves, flexible connectors, and other connection elements shall slip freely into place.
 - e. Alter piping assembly to fit, when proper fit is not obtained.
 - f. Install eccentric reducers or increasers with the top horizontal for pump suction piping.
- D. Buried piping:
 - 1. Bury piping with minimum 4-foot cover without air traps, unless otherwise indicated on the Drawings.
 - 2. Where 2 similar services run parallel to each other, piping for such services may be laid in the same trench.
 - a. Lay piping with sufficient room for assembly and disassembly of joints, for thrust blocks, for other structures, and to meet separation requirements of public health authorities having jurisdiction.

3. Laying piping:
 - a. Lay piping in finished trenches free from water or debris. Begin at the lowest point with bell ends up slope.
 - b. Place piping with top or bottom markings with markings in proper position.
 - c. Lay piping on an unyielding foundation with uniform bearing under the full length of barrels.
 - d. Where joints require external grouting, banding, or pointing, provide space under and immediately in front of the bell end of each section laid with sufficient shape and size for grouting, banding, or pointing of joints.
 - e. At the end of each day's construction, plug open ends of piping temporarily to prevent entrance of debris or animals.
 4. Concrete encase buried pipe installed under concrete slabs or structures.
- E. Venting piping under pressure:
1. Lay piping under pressure flat or at a continuous slope without air traps, unless otherwise indicated on the Drawings.
 2. Install plug valves as air bleeder cocks at high points in piping.
 - a. Provide 1-inch plug valves for water lines, and 2-inch plug valves for sewage and sludge lines, unless otherwise indicated on the Drawings.
 3. Provide additional pipe taps with plug cocks and riser pipes along piping as required for venting during initial filling, disinfecting, and sampling.
 4. Before piping is placed into service, close plug valves and install plugs. Protect plugs and plug valves from corrosion in as specified in Section 09960 – High-Performance Coatings.
- A. Restraining buried piping:
1. Restrain piping at valves and at fittings where piping changes direction, changes sizes, and at ends:
 - a. When piping is underground, use concrete thrust blocks, mechanical restraints, or push-on restraints.
 - b. Determine thrust forces by multiplying the nominal cross-sectional area of the piping by design test pressure of the piping.
 2. Provide restraints with ample size to withstand thrust forces resulting from test pressures:
 - a. During testing, provide suitable temporary restraints where piping does not require permanent restraints.
 3. Place concrete thrust blocks against undisturbed soil.
 4. Place concrete so piping joints, fittings, and other appurtenances are accessible for assembly and disassembly.
 5. Provide underground mechanical restraints where specified in the Piping Schedule.
- B. Restraining above ground piping:
1. Restrain piping at valves and at fittings where piping changes direction, changes sizes, and at ends:
 - a. When piping is aboveground or underwater, use mechanical or structural restraints.
 - b. Determine thrust forces by multiplying the nominal cross-sectional area of the piping by design test pressure of the piping.

2. Provide restraints with ample size to withstand thrust forces resulting from test pressures:
 - a. During testing, provide suitable temporary restraints where piping does not require permanent restraints.
- F. Connections to existing piping:
 1. Expose existing piping to which connections are to be made with sufficient time to permit, where necessary, field adjustments in line, grade, or fittings:
 - a. Protect domestic water/potable water supplies from contamination:
 - 1) Make connections between domestic water supply and other water systems in accordance with requirements of public health authorities.
 - 2) Provide devices approved by Owner of domestic water supply system to prevent flow from other sources into the domestic supply system.
 2. Make connections to existing piping and valves after sections of new piping to be connected have been tested and found satisfactory.
 3. Provide sleeves, flanges, nipples, couplings, adapters, and other fittings needed to install or attach new fittings to existing piping and to make connections to existing piping.
 4. For flanged connections, provide stainless steel bolts with isolation bushings and washers, and full-face flange gaskets.
- G. Connections to in-service piping:
 1. As specified in Section 01140 - Work Restrictions.
- H. Connections between ferrous and nonferrous metals:
 1. Connect ferrous and nonferrous metal piping, tubing, and fittings with dielectric couplings especially designed for the prevention of chemical reactions between dissimilar metals.
 2. Nonferrous metals include aluminum, copper, and copper alloys.
- I. Flanged connections between dissimilar metals such as ductile iron pipe and steel pipe:
 1. Provide stainless steel bolts with isolation bushings and washers, and full-face flange gaskets.

3.02 CLEANING

- A. Piping cleaning:
 1. Upon completion of installation, clean piping interior of foreign matter and debris.
 2. Perform special cleaning when required by the Contract Documents.
- B. Cleaning potable water piping:
 1. Flush and disinfect potable water piping as specified in Section 01757 - Disinfection.
- C. Conduct pressure and leak test, as specified.

PIPING SCHEDULE										
Process Abbrev.	Service	Nominal Diameter (inches)	Material	Pressure Class Special Thickness Class Schedule Wall Thickness	Pipe Spec. Section	Joints/Fittings	Test Pressure/ Method	Lining	Coating	Comments
CW	Cold Water									
	Buried	1/2-2	Copper	Type K	15281	Soldered	100 psig/HH	None	None	
	Exposed	1/2-2	Copper	Type L	15281	Soldered	100 psig/HH	None	None	
D	Drain									
	All	2-12	CISP		15400	B&SP	15 feet/GR	CTP	CTP	
HW	Hot Water									
	Buried	1/2-2	Copper	Type K	15281	Soldered	100 psig/HH	None	None	
	Exposed	1/2-2	Copper	Type L	15281	Soldered	100 psig/HH	None	None	
HPA	High-Pressure Air									
	Buried	1/2-2	BSP	SCH 40	15270	SCRD	45 psig/HH	None	EPP	
	Exposed	1/2-2	BSP	SCH 40	15278	SCRD	45 psig/HH	None	EPP	
PW	Water (Off-Site Potable)									
	Buried	4-54	DIP	PC 250	02703	Restrained Push-on	150 psig/HH	CM	Per Spec.	
	Exposed	4-24	Steel	Per Specification	15278	FL	150 psig/HH	FBE	FBE	Provide urethane topcoat on exposed pipe in outdoor service
R	Reservoir									
	All	6-36	304L SST	0.25-inch	15286	FL	30 feet/GR	None	None	

PIPING SCHEDULE										
Process Abbrev.	Service	Nominal Diameter (inches)	Material	Pressure Class Special Thickness Class Schedule Wall Thickness	Pipe Spec. Section	Joints/Fittings	Test Pressure/ Method	Lining	Coating	Comments
SA	Sample Line									
	Buried	1/2-2	PEX	-	15400	Comp.	100 psig/HH	None	None	Encase in 2-inch SCH 40 PVC sleeve w/ long-radius fittings
	Exposed	1/2-2	316 SST	SCH 40	15286	SCRD	150 psig/HH	None	None	
SD	Storm Drain									
	Buried	8-15	PVC	SDR 26	02705	Push-on	10 feet/GR	None	None	
	Buried	18-36	PVC	ASTM F679 PS115	02705	B&SP	10 feet/GR	None	None	
SDFM	Storm Drain Force Main									
	Buried	6-8	DIP	PC 250	02703	Restrained Push-on	150 psig/HH	CM	Per Spec.	
	Exposed	8	DIP	PC 250	02703	FL	FL	150 psig/HH	FB EPP (EPU-M-1) ^{AD3}	FB Provide urethane topcoat on exposed pipe in outdoor service ^{AD3}
SS	Sanitary Sewer									
	Buried	4-12	PVC	SDR 26	02705	Push-on	10 feet/GR	None	None	
SW	Sample Water									
	Buried	1/2-2	HDPE	-	15400	Comp.	150 psig/HH	None	None	
	Exposed	1/2-2	316 SST	SCH 40	15286	SCRD	150 psig/HH	None	None	
V	Vent									
	All	1/2-4	PVC	SCH 40	15400	Glued	10 feet/GR	None	None	

PIPING SCHEDULE										
Process Abbrev.	Service	Nominal Diameter (inches)	Material	Pressure Class Special Thickness Class Schedule Wall Thickness	Pipe Spec. Section	Joints/ Fittings	Test Pressure/ Method	Lining	Coating	Comments
W	Water (On-Site Potable)									
	Buried	4-54	DIP	PC 250	02703	Restrained Push-on	150 psig/HH	CM	Per Spec.	
	Exposed	12-24	Steel	Per Specification	15278	FL	150 psig/HH	FBE	FBE	Provide urethane topcoat on exposed pipe in outdoor service
	<u>Exposed</u>	<u>30-54</u>	<u>DIP</u>	<u>PC 250</u>	<u>02703</u>	<u>Flanged</u>	<u>150 psig/HH</u>	<u>CM</u>	<u>EPP (EPU-M-1)</u>	<u>Provide urethane topcoat on exposed pipe in outdoor service</u> ^{AD3}

PIPING SCHEDULE										
Process Abbrev.	Service	Nominal Diameter (inches)	Material	Pressure Class Special Thickness Class Schedule Wall Thickness	Pipe Spec. Section	Joints/ Fittings	Test Pressure/ Method	Lining	Coating	Comments
Abbreviations: 1. The following abbreviations used in the column of test method refer to the respective methods as specified in Section 15956 - Piping Systems Testing. AM Air method GR Gravity method HH High head method LH Low head method SC Special case 2. Abbreviations to designate piping include the following: BSP Black steel pipe B&SP Bell and spigot CI Cast iron CISP Cast iron soil pipe CL Class, followed by the designation CM Cement mortar CTP Coal tar pitch DIP Ductile iron piping EPP Epoxy polyurethane coating FBE Fusion Bonded Epoxy FL Flange GA Gauge, preceded by the designation						GE Grooved end joint GL Glass lined GSP Galvanized steel pipe MJ Mechanical joint NPS Nominal pipe size, followed by the number in inches psi pounds per square inch psig pounds per square inch gauge PE Polyethylene PEE Polyethylene encasement PEX Cross-Linked Polyethylene PTW Polyethylene tape wrap PVC Polyvinyl Chloride SCH Schedule, followed by the designation SCRD Screwed-On SST Stainless steel SW Solvent welded VCP Vitrified clay piping WLD Weld 3. "On-site" refers to pipelines within the tank site and access road corridor. "Off-site" refers to pipelines within or adjacent to existing City or County road corridors.				

END OF SECTION

AD3 Addendum No. 3

SECTION 15114

CHECK VALVES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Check valves.
- B. As specified in Section 15110 - Common Work Results for Valves.

1.02 REFERENCES

- A. American Society of Mechanical Engineers (ASME):
 - 1. B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
 - 2. B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Inch Standard.
- B. American Water Works Association (AWWA):
 - 1. C508 - Standard for Swing-Check Valves for Waterworks Service 2 Inch Through 24 Inch NPS.
- C. ASTM International (ASTM):
 - 1. A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - 2. A313 - Standard Specification for Stainless Steel Spring Wire.
 - 3. A536 - Standard Specification for Ductile Iron Castings.
 - 4. B582 - Standard Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Plate, Sheet, and Strip.
 - 5. B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.

1.03 SYSTEM DESCRIPTION

- A. Design requirements:
 - 1. Check valves: When not otherwise specified as indicated on the Drawings, provide check valves suitable for service as follows:
 - a. In either horizontal or vertical position.
 - b. Suitable for service working pressures up to 150 pounds per square inch gauge.

1.04 SUBMITTALS

- A. Submit as specified in Section 01330 - Submittal Procedures.

- B. Product data: As specified in Section 15110 - Common Work Results for Valves.
- C. Commissioning submittals:
 - 1. Provide Manufacturer's Certificate of Installation and Functionality Compliance as specified in Section 01756 - Commissioning.

1.05 WARRANTY

- A. Provide warranty as specified in Section 01783 - Warranties and Bonds.

PART 2 PRODUCTS

2.01 SURGEBUSTER SWING CHECK VALVE

- A. Manufacturers:
 - 1. Val-Matic Surgebuster Swing Check Valve (no equal).
- B. Valve design:
 - 1. Domed access cover with threaded port and mechanical disc position indicator.
 - 2. Two internal moving parts:
 - a. Flexible disc.
 - b. Disc accelerator.
 - 3. Buna-N rubber disc.
 - 4. Bottom-mounted oil dashpot for closing speed control.
 - 5. NSF 61 approved fusion bonded epoxy lining and coating.
- C. Materials:
 - 1. Body and cover: Cast iron, ASTM A126 Grade B.
 - 2. Disc: Buna-N with alloy steel and nylon reinforcement.
 - 3. Mechanical indicator: Aluminum bronze or stainless steel.
 - 4. Disc accelerator: Stainless steel.

2.02 SWING CHECK VALVES

- A. Valves 4 inches through 24 inches at the Storm Drain Pump Station:
 - 1. Manufacturers: One of the following or equal:
 - a. Kennedy, Figure 106LW or M&H, Model 159.
 - b. Mueller Co., Model A-2600.
 - c. APCO Model 250.
 - d. Crispin SWL Series.
 - 2. Valve design:
 - a. In accordance with AWWA C508.
 - b. Constructed to permit top entry and removal of internal components without removing the valve.
 - c. Equipped with outside lever and weight.
 - 3. Materials:
 - a. Body: Cast iron, ASTM A126 Class B or ASTM A536 Grade 65-45-12 Ductile Iron.
 - b. Disc:
 - 1) Valve disc shall be ASTM A126 cast iron, ASTM A536 ductile iron, or ASTM B584 bronze.

- 2) 4-inch valves: Bronze or stainless steel rings and seats.
 - 3) 6 inches and larger valves: Bronze-faced or stainless steel rings and seats.
 - 4) Rubber seat Buna-N or EPDM.
 - c. Hinge pins: Stainless steel.

2.03 TILTED DISC CHECK VALVES

- A. Manufacturers: One of the following or equal:
 - 1. APCO, Series 800-T.
 - 2. ValMatic Series 9800-T.
 - 3. Crispin, Series TD.
- B. Valve design: 2-piece construction, bolted at the center, with disc at an angle of 55 angular degrees:
 - 1. Minimum cross-sectional area throughout valve body: Equal to cross-sectional area of the pipe connected to the valve.
 - 2. Control disc closing with top-mounted, oil-filled, cushion chamber.
 - 3. Fit cylinder with a flow control valve.
 - 4. Ends: Flanged, ASME B16.1.
- C. Materials:
 - 1. Body and disc: Cast iron, ASTM A126, Class B.
 - 2. Seat ring and disc ring: Bronze, ASTM B584, Alloy C 92200, Alloy C 83600, Alloy C 94700, or Alloy C 93700.
 - 3. Pivot pins: Stainless steel, ASTM A582.
 - 4. Bushings: Stainless steel.
 - 5. Oil reservoirs: Stainless steel. ^{AD3}

2.022.04 DUCKBILL CHECK VALVES

- A. Manufacturers: One of the following or equal:
 - 1. Tide Flex, Series TF-2.
 - 2. J&S Valve Hedflex.
 - 3. Proco Products, Inc. 700 Series.
- B. Design:
 - 1. Maximum downstream head: 0 feet.
 - 2. With internal pressure 1 to 2 inches w.c. above backpressure, bill of valve opens, allowing flow.
 - 3. With backpressure 1 to 2 inches w.c. above internal pressure, bill of valve closes, preventing backflow.
- C. End connection:
 - 1. Flanged.

- D. Materials of construction:
 - 1. Single piece elastomer construction with internal polyester fabric reinforcing all vulcanized into a composite material.
 - a. Internal reinforcing sufficient to maintain structural integrity under the specified operating conditions.
 - b. Exterior applications require coating for UV protection and to resist pest gnawing.
 - 2. Elastomeric material: Nitrile rubber or EPDM.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Flapper-type check valves:
 - 1. Install with proper orientation of flow direction arrow on valve body.
 - 2. When installed in horizontal pipelines, mount with shaft on vertical locations.
 - 3. When mounted in a vertical pipeline, directly downstream of an elbow, mount with the shaft perpendicular to the outermost portion of the elbow.
 - 4. Mount on downstream side of discharge silencer when used on positive displacement and centrifugal blowers.

3.02 FIELD APPLIED COATING OF VALVE EXTERIOR

- A. Match color and be compatible with manufacturer's coating system and as specified in Section 09960 - High-Performance Coatings.
 - 1. When shop applied finish coating matches field applied coating on adjacent piping, touch up shop coating in damaged areas in accordance with instructions recommended by the paint manufacturer.
 - 2. When shop applied coating does not match field coating on adjacent piping, or when damage has occurred to the shop applied coating that requires more than touchup, blast clean valve surfaces or utilize other surface preparation recommended by the manufacturer of the coating material and apply the coating system used for coating adjacent piping.

3.03 COMMISSIONING

- A. As specified in Section 01756 - Commissioning and this Section.
- B. Manufacturer services:
 - 1. Provide certificates:
 - a. Manufacturer's Certificate of Installation and Functionality Compliance.
- C. Functional testing:
 - 1. Valves:
 - a. Test witnessing: Witnessed.
 - b. Conduct pressure and leak test, as specified in Section 15956 - Piping Systems Testing.

END OF SECTION

AD3 Addendum No. 3

New Section

SECTION 15116^{AD3}

PLUG VALVES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Non-lubricated plug valves.
- B. As specified in Section 15110 - Common Work Results for Valves.

1.02 REFERENCES

- A. American Water Works Association (AWWA):
 - 1. C517 - Resilient-Seated Cast Iron Eccentric Plug Valves.
 - 2. C606 - Grooved and Shouldered Joints.

1.03 SUBMITTALS

- A. Submit as specified in Section 01330 - Submittal Procedures and 15110 - Common Work Results for Valves.
- B. Product data.
- C. Shop drawings.
- D. Calculations.
- E. Vendor operation and maintenance manual as specified in Section 01782 - Operation and Maintenance Data.
- F. Commissioning submittals:
 - 1. Provide Manufacturer's Certificate of Source Testing as specified in Section 01756 - Commissioning:
 - a. Interior coating.
 - 2. Provide Manufacturer's Certificate of Installation and Functionality Compliance as specified in Section 01756 - Commissioning.

1.04 WARRANTY

- A. Provide warranty as specified in Section 01783 - Warranties and Bonds.

PART 2 PRODUCTS

2.01 GENERAL

- A. As specified in Section 15110 - Common Work Results for Valves.

2.02 NON-LUBRICATED PLUG VALVES

- A. Manufacturers: One of the following or equal:
 - 1. DeZurik, "PEC".
 - 2. Clow Valve.
 - 3. Milliken Valve, Model 600/601.
- B. Design:
 - 1. Type: Non-lubricated eccentric type, in accordance with AWWA C517.
 - 2. Plug face: Resilient material that operates satisfactorily at the design temperatures specified in Section 01610 – Design Criteria.
 - 3. Compression washer: Provide flat compression washer made of Teflon™, or of a material having equal physical characteristics on valve stem between plug and bonnet.
 - 4. Stem seals: Provide stem seals serviceable without unbolting the valve bonnet assembly.
 - 5. Grit excluders: Provide PTFE grit excluders at upper plug journals to prevent entry of foreign solids in bearing area.
 - 6. Clearly mark valves to indicate their open and closed positions.
 - 7. Provide valves with ends as required by piping details indicated on the Drawings.
- C. Materials:
 - 1. Body and plug: Type 316 Stainless Steel.
 - 2. Stem bearing and bottom bearing: Type 316 stainless steel.
 - 3. Internal parts, except the body and plug: Type 316 stainless steel.
 - 4. Exposed nuts, bolts, and washers: Stainless steel.

2.03 SHIPMENT, SPARE PARTS, MAINTENANCE PRODUCTS, AND SPECIAL TOOLS

- A. As specified in Section 01600 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install valves as specified in Section 15110 - Common Work Results for Valves and the manufacturer's instructions.
 - 1. Unless differently indicated on the Drawings install valves so that in the closed position the pressure in the pipeline applies a seating head on the valves.
 - 2. Install valves so that in the open position the plug is located in the top half of the valve body.

3.02 COMMISSIONING

- A. As specified in Section 01756 - Commissioning and this Section.

- B. Manufacturer services:
 - 1. Provide certificates:
 - a. Manufacturer's Certificate of Installation and Functionality Compliance.
- C. Functional testing:
 - 1. Valves:
 - a. Test witnessing: Witnessed.
 - b. Conduct pressure and leak test as specified in Section 15110 - Common Work Results for Valves.

END OF SECTION

^{AD3} Addendum No. 3

SECTION 17950

COMMISSIONING FOR INSTRUMENTATION AND CONTROLS

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PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Testing requirements that apply to process control and instrumentation systems for the entire Project.

1.02 REFERENCES

- A. As specified in Section 17050 - Common Work Results for Process Control and Instrumentation Systems.
- B. Electronics Industries Alliance (EIA).
- C. Telecommunications Industry Association (TIA).

1.03 DEFINITIONS

- A. As specified in Sections 01756 - Commissioning and 17050 - Common Work Results for Process Control and Instrumentation Systems.
- B. Specific definitions:
 - 1. Complete End-to-End Testing (CEET) - Signals are tested from the field device through the PLC program, the network, and all the way to the operator's HMI graphic screens.
 - 2. Loop Validation Tests - Signals are tested from the field device to the PLC.
 - 3. Platform Testing: Testing of the PLC and SCADA/HMI at the manufacturer's or programmer's shop to demonstrate the program's functionality based upon specified and designed control requirements.

1.04 SYSTEM DESCRIPTION (NOT USED)

1.05 SUBMITTALS

- A. Furnish submittals as specified in Section 01330 - Submittal Procedures.
- B. General:
 - 1. Reference additional detailed test submittal scheduling and prerequisite requirements as specified in the Sequencing article of Section 17050 - Common Work Results for Process Control and Instrumentation Systems.
- C. Overall test plan:
 - 1. Develop the PCIS system test submittals in consultation and cooperation with all applicable subcontractors.
 - 2. Develop and submit an overall testing plan for the PCIS. The overall test plan to be reviewed and approved by the Engineer before detailed test plans, procedures, and forms will be reviewed.
 - 3. Describe the test phases as they apply specifically to this Project and each process system.
 - 4. Provide a preliminary testing schedule to show the sequence of tests and commissioning as they apply to each process system and each PLC. Coordinate with the design engineer.

5. Provide a description of factory tests. Describe what equipment will be included, what testing equipment will be used, and the simulator that will be used.
 6. Provide examples of proposed forms and checklists.
- D. Test procedures:
1. Develop and submit detailed test procedures to show that the integrated SCADA system hardware and software is fully operational and in compliance with the requirements specified in the Contract Documents.
 2. Provide a statement of test objectives for each test.
 3. Prepare specific procedures for each process system.
 4. Describe sequentially the steps to be followed in verifying the correct operation of each process system, including all features described in the loop descriptions, control strategies, and shown in the P&IDs. Implied or generic test procedures are not acceptable.
 5. Specify who will perform the tests, specifically what testing equipment will be used (including serial numbers and NIST-traceable calibration), and how the testing equipment will be used.
 6. Describe the expected role of the Engineer, as well as any requirements for assistance from Owner's staff.
 7. Provide the forms and checklists to be used.
- E. Test forms:
1. Submit completed calibration forms, test forms, and checklists.
 - a. Test forms shall include the detailed test procedures, or shall include clear references to separate pages containing the complete test procedure applicable to each form. If references to procedures are used, the complete procedure shall be included with each test binder.
 - b. Every page of each test form shall include project name, date, time, name of person conducting the test, signature of person conducting the test, and for witnessed tests, place for signature of person (Engineer and Owner) witnessing the test.
 - c. Sample test forms at the end of this Section show the minimum required content.
 - 1) The sample test forms have not been customized for this Project.
 - 2) Contractor shall develop and submit test forms customized for the Project and meeting the specified test and submittal requirements.
- F. FAT procedure additional minimal requirements:
1. Prepare and submit a FAT procedure which includes:
 - a. Control system testing block diagram.
 - b. Estimated test duration.
- G. Details on the simulator construction, components, and operation. Testing binders:
1. Sub-system to be tested, provide and submit a test binder containing all test procedures and individual test forms for the test. References to other documents for test procedures and requirements are not acceptable.
 2. Fill out in advance headings and all other information known before the test.
 3. Include applicable test plan information, as well as a list of all test prerequisites, test personnel, and equipment.

4. Include or list reference material and provide separately at the time of the test.
5. Record test results and verify that all test requirements and conditions have been met.

H. Test reports:

1. At the conclusion of each test, submit a complete test report, including all test results and certifications.
2. Include all completed test binders, forms, and checklists.
3. Submission, review, and acceptance of each test report is required before the start of the sub-system.

1.06 QUALITY ASSURANCE

A. Test personnel:

1. Furnish qualified technical personnel to perform all calibration, testing, and verification. The test personnel are required to be familiar with this Project and the equipment, software, and systems before being assigned to the test program.

1.07 DELIVERY, STORAGE, AND HANDLING (NOT USED)

1.08 PROJECT OR SITE CONDITIONS (NOT USED)

1.09 SEQUENCING (NOT USED)

1.10 SCHEDULING

- A. As specified in Section 17050 - Common Work Results for Process Control and Instrumentation Systems.

1.11 WARRANTY (NOT USED)

1.12 SYSTEM START-UP (NOT USED)

1.13 OWNER'S INSTRUCTIONS (NOT USED)

1.14 MAINTENANCE (NOT USED)

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION (NOT USED)

3.02 PREPARATION (NOT USED)

3.03 INSTALLATION

- A. As specified in Section 17050 - Common Work Results for Process Control and Instrumentation Systems.
- B. Installation supervision:
 - 1. Provide as specified in Section 17050 - Common Work Results for Process Control and Instrumentation Systems.

3.04 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)

3.05 REPAIR/RESTORATION (NOT USED)

3.06 COMMISSIONING

- A. Commissioning as specified in Section 01756 - Commissioning.
- B. Testing and training phase:
 - 1. Source testing:
 - a. Manufacturer services: Provide as specified in the table below.

Section Number	Section Title	Source Testing (Witnessed or Non-Witnessed)
17055 - Packaged Control System	Packaged Control System	N/A
17100 - Control Strategies	Control Strategies	Witnessed
17101 - Specific Control Strategies	Specific Control Strategies	Witnessed
17710 - Control Systems - Panels, Enclosures, and Panel Components.	Control Systems - Panels, Enclosures, and Panel Components	Witnessed
17950 – Commissioning for Instrumentation and Controls	Commissioning for Instrumentation and Controls	Witnessed

- b. Prerequisite requirements:
 - 1) Engineer approval of the hardware and equipment source testing submittal, Manufacturer Certificate of Source Testing, is required before proceeding to Preliminary FAT.
- c. Preliminary FAT (Pre-FAT):
 - 1) The purpose of the Pre-FAT is to provide assurance that the HMI/SCADA system is ready for the full, witnessed FAT, in terms of both stability and functionality.
 - a) Debugging of software and troubleshooting of hardware shall occur during and before the pre-FAT, not during the FAT.
 - b) Contractor shall fully test the HMI/SCADA system and fix all deficiencies found before the FAT.
 - 2) Conduct utilizing test procedures approved by Engineer.

- 3) Owner shall have the right to witness any or all of the Pre-FAT testing and shall be notified in writing 20 days before the start of the pre-FAT.
 - 4) Submit a letter, signed by the Contractor's project manager or company officer, certifying that integrated system hardware and software has been tested and confirmed to be fully operational and in compliance with the requirements specified in the Contract Documents and is fully ready for the full, witnessed FAT.
 - a) Attach the completed pre-FAT test forms, signed by the Contractor's staff.
 - 5) Engineer approval of the pre-FAT submittal is required before proceeding to FAT.
- d. FAT hardware and communications testing:
- 1) Perform tests to show that the integrated system hardware and software is fully operational and in compliance with the requirements specified in the Contract Documents.
 - 2) The complete PCIS system including operator stations, servers, network equipment, printers, PCMs, PLCs, RTUs, LCPs, CCS, peripherals, communications equipment, and other HMI/SCADA equipment, shall be assembled, connected, and software loaded for a fully functional FAT of the integrated system.
 - 3) Testing simulation:
 - a) Inputs and outputs shall be simulated, and proper control and system operation shall be validated.
 - b) FAT shall make use of simulators that contain switches, pilot lights, variable analog signal generators, and analog signal level displays, which shall be connected to the I/O points within the HMI/SCADA system.
 - (1) The use of jumper wires, terminal block mounted pilot lights, and loose meters to act as or supply the functionality of a simulator shall not be allowed.
 - (2) The simulator may consist of a PLC, operating under an HMI/SCADA software package, or other approved software that has its I/O points wired to PLC's I/O points.
 - (3) Software operating on a PC may then act as the switches, pilot lights, variable analog signal generators, and analog signal level displays.
 - 4) Additional source tests are specified in other sections of the Instrumentation and Control Specifications.
 - 5) Owner shall have the right to witness any or all of the FAT testing and shall be notified in writing 20 days before the start of the FAT.
 - 6) Verify communications between the hardware and the programmer's software comply with specified requirements.
 - a) For systems that contain RTUs or remote communications with other devices, the complete communications system must be factory tested, including actual interfacing with telephone company equipment and/or the actual radios used for radio based telemetry systems.

- 7) Panel inspections:
 - a) Engineer will inspect each control panel for completeness, workmanship, fit and finish, and compliance with the Contract Documents and the accepted shop drawings.
 - (1) Inspection to include, as a minimum: Layout, mounting, wire and data cable routing, wire tags, power supply, components and wiring, I/O components layout (including terminals, wiring and relays), device layout on doors and front panels, and proper ventilation operation.
 - b) Inspection forms:
 - (1) Provide panel inspection forms as part of the FAT procedures submittal.
 - (2) A sample FAT control panel form has been provided at the end of this Section.
- 8) I/O test:
 - a) Engineer will verify that I/O is properly wired to field terminals and is properly mapped into the PLC and the rest of the SCADA system, including all operator interface devices.
 - b) Test methodology:
 - (1) Discrete inputs:
 - (a) Apply appropriate input from simulator at panel terminal, observe input card indicator, observe data value at each indicated data address, and observe data received at field wiring terminals or operator interface screen.
 - (2) Discrete outputs:
 - (a) Issue commands from operator interface screen or PLC, verify output card indicator light, and measure response at field wiring terminals or multimeter.
 - (3) Analog inputs:
 - (a) Apply appropriate analog input signal at panel terminals on simulator, observe data value at each indicated data address, and observe data properly received at field wiring terminals or operator interface screen.
 - (b) Check each point at 0 percent, 50 percent, and 100 percent of scale.
 - (4) Analog outputs:
 - (a) Enter scaled values in the output buffer file, observe the output data file value, and measure appropriate response at field wiring terminals or multimeter.
 - (b) Check each point at 0 percent, 50 percent, and 100 percent of scale.
 - c) Test forms to include, but not be limited to the following data:
 - (1) PLC and panel number.
 - (2) I/O type.
 - (3) I/O tag name.
 - (4) Rack/slot/number of I/O point.
 - (5) Check-off for correct response for each I/O point.
 - (6) Comments field.
 - (7) Initials of individual performing test.

- (8) Date test was performed.
 - (9) Witness signature lines.
 - 9) System configuration test:
 - a) Demonstrate and test the setup and configuration of operator stations, servers, development stations, and peripherals.
 - b) Demonstrate utility software and functions, such as virus protection, backup, optical drive burning, network monitoring, etc.
 - c) Demonstrate the proper operation of peripheral hardware.
 - d) Demonstrate general HMI/SCADA functions.
 - e) Demonstrate proper operation of log-on and other security access functions.
 - f) Demonstrate the proper operation of all historical data storage, trend, display, backup, and report functions.
 - g) Test automatic fail over of redundant equipment.
 - h) Demonstrate the proper operation of the alarm display and acknowledgement functions.
 - i) Test forms:
 - (1) For each test, list the specification page and paragraph of the function demonstrated, and provide a description of the function.
 - (2) List the specific tests and steps to be conducted.
 - (3) For each function, list all of the different sub-functions or ways the function can be used, and provide a test check-off for each:
 - (a) Include signature and date lines.
 - 10) Engineer approval of the FAT Communication Testing activities is required before proceeding to FAT Platform Testing.
- e. FAT Platform Testing - Control logic test:
 - 1) Verify the PLC, HMI and SCADA, provides monitoring and control functionality based upon specified and designed control requirements.
 - 2) Testing requirements:
 - a) Demonstrate each function described in the Control Strategies.
 - b) Demonstrate in detail how each function operates under a variety of operating scenarios.
 - (1) Test to verify the application of each general control strategy function to each specific control strategy or loop description.
 - c) Demonstrate the proper operation of the programming and configuration for each control strategy or loop description.
 - (1) Test each strategy or loop description on a sentence by sentence and function by function basis.
 - (2) Loops with similar or identical logic must each be tested individually.
 - (3) Test the boundaries of each numeric operator input by entering values outside of the allowable range.
 - d) Demonstrate the proper operation of all digital communication links and networks.
 - (1) Verify each digital communication I/O point.
 - e) Failure testing: Demonstrate how the system responds to and recovers from abnormal conditions including, but not limited to:

equipment failure, operator error, communications subsystem error, communications failures, simulated/forced software lockups, power failure (both utility power and power to HMI and/or SCADA hardware), process equipment failure, and high system loading conditions.

- 3) Test forms:
 - a) Submit completed test forms for each loop including but not limited to the fully revised and approved control strategy.
 - b) Identify the cause and effect as each I/O point is toggled through the simulator.
 - (1) Identify and track proper and/or improper operation of the loop.
 - c) Note any deficiencies or operational changes on the forms for correction and documentation:
 - (1) Include signature and date lines.
- 4) Engineer approval of the FAT submittal is required prior to shipment of system components.

2. Owner training:

- a. Demonstration requirements are specified in this Section. The Engineering Firm will provide training except for instruments.

Table 1			
Course Title	Minimum Course Length (hours per session)	Personnel (Estimated Number of Students)	Minimum Number of Sessions
System Overview	0	0	0
Operator Training - Basic	0	0	0
Operator Training - Advanced	0	0	0
CIS (Computer) Equipment Maintenance	0	0	0
HMI Software	0	0	0
Historian System Training	0	0	0
Reports Training	0	0	0
PLC Hardware	0	0	0
PLC Software	0	0	0
LOI Hardware and Software	0	0	0
Network Equipment	0	0	0
Follow-Up Training	0	0	0
Instrument Training	8	3	1

b. Instrumentation training:

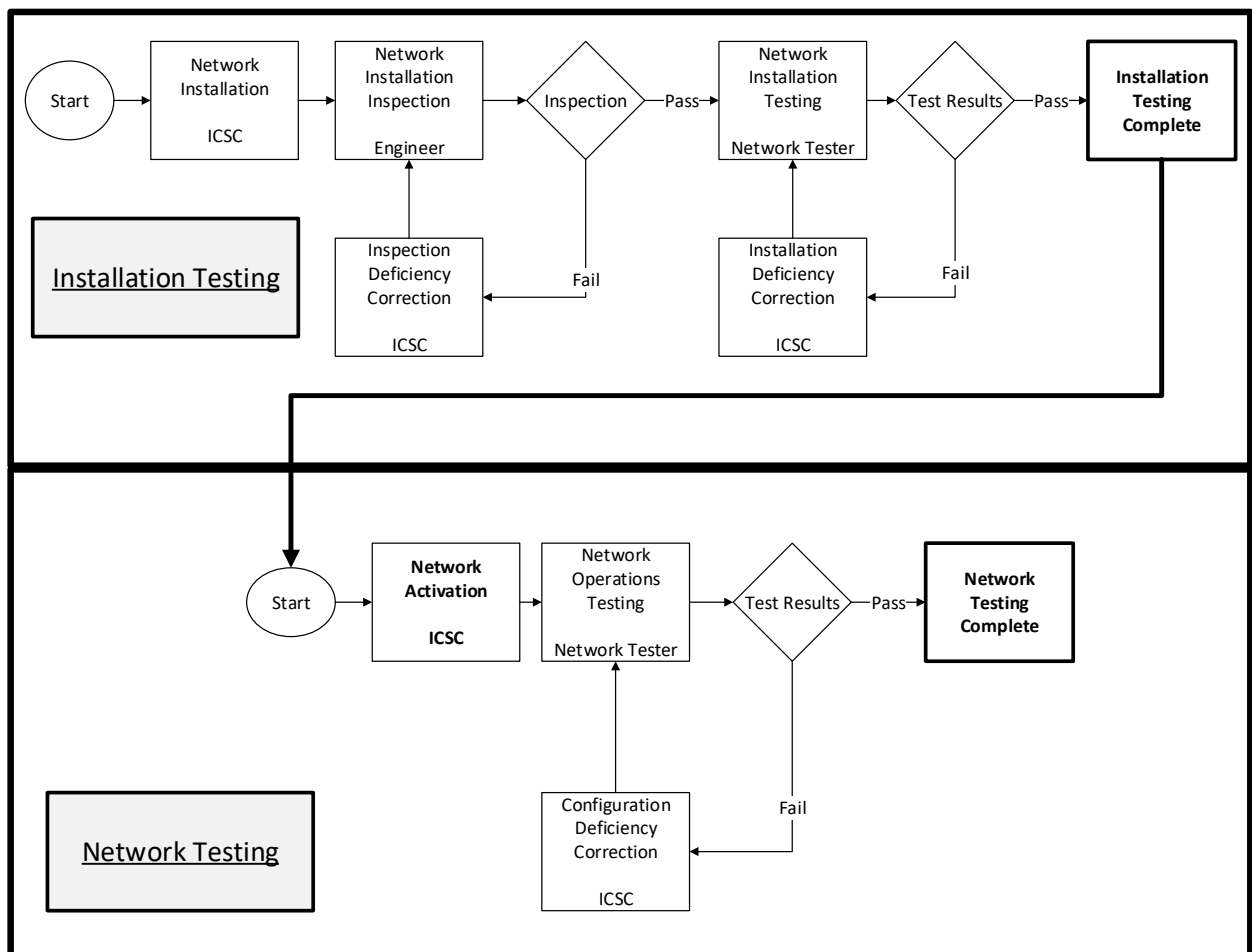
- 1) Furnish training covering all instruments and control panels.
- 2) Furnish the specified quantity of training, allocated to cover new instruments and hardwired controls as specified in this Section and specifically determined in the accepted training plan.

- 3) Train maintenance staff in the use, cleaning, calibration, maintenance, and troubleshooting of all the instruments furnished within this Project.
- 4) Furnish training on the operation of new hardwired controls.
- c. Analytical instrument training:
 - 1) Furnish training covering all analytical instruments.
 - 2) Furnish the specified quantity of training, allocated to cover new analytical instruments as specified in this Section and specifically determined in the accepted training plan.
 - 3) Train maintenance staff in the use, cleaning, calibration, maintenance, and troubleshooting of all the analytical instruments furnished within this Project.
 - 4) Provide training by manufacturer.
3. Installation testing:
 - a. Calibration:
 - 1) Performed by Contractor and ICSC.
 - 2) Calibrate and adjust all instruments, devices, valves, and systems, in conformance with the component manufacturer's instructions and as specified in these Contract Documents.
 - 3) Replace either individually or within a system, defective elements that cannot achieve proper calibration or accuracy.
 - a) Calibration for discrete devices:
 - (1) Calibrate and adjust devices for reliable operation and to avoid nuisance tripping.
 - b) Calibration for ultrasonic and radar level devices:
 - (1) Provide Echo Transmission and signal quality on level transmitters including guided and unguided units.
 - (a) Submit printout of the actual transmission and parameters.
 - (2) Adjust mounting, as required, to obtain accurate readings.
 - (3) Post mounting: Provide any additional calibration required by manufacturer.
 - c) Calibrating analog transmitters:
 - (1) Components having adjustable features are to be set accurately for the specific conditions and applications of this installation.
 - (2) Test and verify that components and/or systems are within the specified limits of accuracy.
 - (3) Calibration points:
 - (a) Calibrate each analog instrument at 0 percent, 25 percent, 50 percent, 75 percent, and 100 percent of span, using test instruments with accuracies traceable to NIST.
 - (4) Field verify calibration of instruments including units that have been factory-calibrated to determine whether any of the calibrations are in need of adjustment.
 - d) Analyzer calibration:
 - (1) Calibrate and test each analyzer system as a workable system after installation. Follow the testing procedures directed by the manufacturers' technical representatives.
 - (2) Submit completed instrument calibration sheets for every field instrument and analyzer.

- (3) Calibration tags:
 - (a) Attach a calibration and testing tag to each instrument, piece of equipment, or system.
 - (b) Sign the tag when calibration is complete.
 - e) Calibration for industrial networking test equipment.
 - f) Submit calibration documentation.
- b. Loop check:
 - 1) Performed by the Contractor.
 - 2) Cabling installed, terminated, and labeled.
 - 3) Perform continuity check of wiring to each field device through intermediate devices to field terminals in the cabinet.
 - 4) Complete loop check form for each device.
 - 5) Submit loop check test results before proceeding to the next step.
- c. Loop validation tests:
 - 1) Performed by the Contractor, ICSC, and manufacturer's representative, working together, and witnessed by the Owner or Owner's representative.
 - 2) Perform tests on the signal from each field device through intermediate devices to the I/O module on the PLC.
 - a) The PLC may or may not be connected to the network.
 - 3) Engineer approval of the loop validation test submittal is required before proceeding to CEET.
- d. LAN cable post-testing:
 - 1) Performed by Contractor and ICSC.
 - 2) After installing the cable and connectors, test all cables using the LAN certification to confirm the installation meets the requirements of the specification.
 - 3) Provide test documentation that includes the cable number, total length of cable, a permanent hard copy, as well as a-USB or CD copy of all traces.
 - a) After installing connectors:
 - (1) Perform cable end-to-end testing on all installed cables from both ends of the cable.
 - (2) Test shall include cable system performance tests and confirm the absence of wiring errors.
 - (3) Submit a signed test report presenting the results of the cable testing.
 - (4) Repair or replace any portions of the system not meeting TIA/EIA standards for installed cabling. Repaired sections shall be retested.
 - 4) Submit final documentation (including traces), using the approved test form, to the Engineer upon successful completion of the testing.
 - 5) Engineer approval of the LAN cable post-testing submittal is required before proceeding to CEET.
- e. Industrial network testing:
 - 1) General test requirements:
 - a) Contractor will hire a 'Network Tester' who is a Certified Fiber Optics Installer for testing for the proper installation and operation of the Fiber Optic network.
 - b) Provide necessary components and labor required to address changes required to bring the network into compliance.

- c) Personnel shall be available at the time of network inspection and testing to address network deficiencies.
- d) Before commencing any network inspection or testing activities:
 - (1) Verify that network segments and nodes are in their final installed condition.
 - (a) Network node devices installed.
 - (b) Field devices physically disconnected from the network.
 - (2) Process and process equipment is not dependent on operation of the network.
 - (3) Inspect network components and deficiencies addressed.
 - (4) Manufacturer's data and specifications for installed network components, available on-site for use by the network testing firm.
 - (5) A complete set of Contract Documents included addenda and change orders are available on-site for use by the network testing firm.
- e) Network operation may be interrupted for inspection and testing.
- f) Figure 1, Network Test Sequence and Responsibilities, defines the general test sequence.

Figure 1 - Network Test Sequence and Responsibilities



- 2) Network installation testing:
 - a) Performed by Contractor/ICSC, Network Tester, and Owner's representative working together.
 - b) This activity focuses on the physical media and its installation.
 - c) Conduct a physical inspection to establish the network configuration as indicated on the Drawings:
 - (1) Validate the node type and quantity.
 - (2) Identify improper installation and damaged components.
 - d) Validate integrity of cables and connectors via a physical media test to confirm the signal propagation capabilities of the network media using visual and mechanical inspection:
 - (1) Compare network devices nameplate data with drawings and specifications.
 - (2) Confirm network components are PTO compliant.
 - (3) Verify labeling of trunk cables.
 - (4) Confirm permissible cable length.
 - (5) Confirm correct cable type.
 - (6) Verify the presence/absence of stub lines.
 - (7) Verify network terminators are in place.
 - (8) Verify power supply source and connections for active terminations.
 - (9) Verify total network node count.
 - (10) Verify power supply specifications including quantity, ratings, locations, and configuration. Verify power supply source of supply location, conductor size, and rating.
 - (11) Inspect accessible network cabling for adherence to specified installation practices:
 - (a) Cable installed in conduit or protective raceway.
 - (b) Cable proximity to high voltage wiring.
 - (c) Exposure to extreme temperatures, shock, vibration, chemicals, or moisture.
 - (d) Bend radius.
 - (12) Inspect cable and conductor terminations for adherence to specified installation practices.
 - (13) Check all accessible components for evidence of physical damage.
 - (14) Check grounding techniques including ground conductor sizes and termination points.
 - (15) Eliminate signal reflections.
 - e) Electrical tests:
 - (1) Measure total network resistance.
 - (2) Cable length and configuration evaluation:
 - (a) Confirm the network cable topology (length and configuration) does not exceed data rate limitations.
 - (b) Confirm total stub length (if required by design) does not exceed data rate limitations.
 - (c) Calculate spare trunk length for the specified data rate.
 - (3) Line analysis for the following conditions:
 - (a) Short circuit between signal lines A and B.
 - (b) Short circuit between signal lines A and B and the cable shield.
 - (c) Shield continuity.

- (d) Cross-wired signals lines.
 - (e) Terminator installed in wrong position.
 - (f) Poor transmission or reception levels.
 - (g) Non-permissible stub line.
- (4) Examine the data traffic between the master and each slave device.
- (5) Verify baud rate meets specified requirements.
- (6) Confirm signal level meets specified requirements.
- (7) Verify network cycle time meets specified requirements.
- (8) Generate slave device list.
- (9) Verify and record scanner diagnostic data including node status and error codes.
- (10) Monitor and capture network waveform.
- (11) Measure and record power supply voltage at active terminations.
- f) Submit corrective measures recommendations based on the results of the inspections and testing.
- g) Engineer approval of the network installation validation and testing submittal is required before proceeding to network operations validation and testing.
- 3) Network Operations Testing:
 - a) Performed by Contractor/ICSC.
 - b) Online evaluation:
 - (1) Confirm specified slave devices appear on the live list.
 - (2) Evaluate data traffic between master and each slave to confirm proper slave configuration and performance.
 - (3) Inspect waveform capture for evidence of excessive noise.
 - (4) Evaluate and report any failed or questionable network tests.
 - (5) Evaluate and report network error codes and related symptoms.
 - c) Network Operations Validation and Testing Report:
 - (1) Prepare a report that documents the results of the qualification and testing activities include, but not limited to, the following:
 - (a) Document the installed condition of the network and provide baseline values for future network maintenance and testing activities.
 - (b) Executive summary for each network including the following:
 - Inspection and test results for each network.
 - Calculated network parameters.
 - Recommendations.
 - Description of test procedures and required test equipment.
 - Network agency specifications.
 - (c) Manufacturer's specifications and guidelines:
 - Include applicable manufacturer's specifications and guidelines.
 - Manufacturer's specifications and guidelines may supersede the specifications of the applicable governing body for the associated network but at

- a minimum must meet the governing body's requirements.
- d) Submit final report of the industrial network testing to the Engineer upon successful completion of the testing.
- 4) Engineer approval of the industrial network testing submittals is required before proceeding to CEET.
- f. Complete End-to-End Testing (CEET):
 - 1) Performed by Contractor, ICSC, and manufacturer's representative working together, with assistance from the OWNER or the inspection staff, as needed.
 - a) The participants need to be dedicated full-time to CEET.
 - b) ICSC will provide staff to verify input signals at, and create output signals from, an HMI or Engineering Workstation.
 - c) Contractor and ICSC will be responsible for creating field signals and verifying proper operation of final control elements.
 - 2) Prerequisites:
 - a) CEET cannot begin until the successful completion of the preceding tests:
 - (1) Calibration.
 - (2) Loop check.
 - (3) Loop validation tests.
 - (4) LAN cable post-testing.
 - (5) Industrial network testing.
 - 3) Testing description:
 - a) This testing is to ensure all I/O signals operate to the intent of the design from the field device to the HMI and all other auxiliary controls and indicators in the PCS.
 - b) Connect PLC to the network to test signals from the field device through the PLC program, the network, and to the operator's HMI graphic screens. The outputs will be energized for a duration long enough to verify proper operation of the final control element.
 - c) SCADA screens:
 - (1) Test and record operator commands and signal readouts to each operator device where there is more than one operator interface point.
 - (2) For each signal, perform separate tests for SCADA computer screens, local operator interface (LOI) screens, and local control panels.
 - (3) Retest any loop following any necessary corrections.
 - 4) Check control loops under simulated operating conditions by causing a range of input signals at the primary control elements and observing appropriate responses of the respective control and monitoring elements, final control elements, and the graphic displays associated with the HMI/SCADA system.
 - a) Use actual process inputs wherever available.
 - b) Issue commands from the HMI/SCADA system and verify proper responses of field devices.
 - (1) Test SCADA system inputs from field device to SCADA system operator workstations.
 - (a) Track responses through trend charts in the HMI/SCADA system.

- (2) Test SCADA system outputs from SCADA operator workstations to field devices and equipment.
- b) Observe and record responses at intermediate devices (if any).
- 2) Discrete device testing:
 - a) Exercise each field device providing a discrete input to the HMI/SCADA system in the field and observe the proper operation shall be observed at the operator workstation:
 - (1) Test limit switches, set limits mechanically, and observe proper operation at the operator workstation.
 - (2) Exercise starters, relay contacts, switch contacts, and observe proper operation.
 - (3) Calibrate and test instruments supplying discrete inputs, and observe proper operation.
 - b) Test each device accepting a discrete output signal from the HMI/SCADA. Perform the appropriate operator action at the SCADA operator stations (including LOIs, if present) and confirm the proper operation of the field device:
 - (1) Stroke valves through outputs from the HMI/SCADA system, and confirm proper directional operation. Confirm travel limits and any feedback signals to the HMI/SCADA system.
 - (2) Exercise motors starters from the HMI/SCADA system and verify proper operation through direct field observation.
 - (3) Exercise solenoids and other field devices from the HMI/SCADA system and verify proper operation through direct field observation.
- 3) Analog device testing:
 - a) Apply continuously variable up and down analog inputs to verify the proper operation and setting of discrete devices (signal trips, etc.).
 - b) Apply provisional settings on controllers and alarm setpoints.
- 4) Analog input:
 - a) Exercise each field device monitoring the analog signal, through the HMI/SCADA system.
 - (1) Apply simulated sensor inputs corresponding to 0 percent, 25 percent, 50 percent, 75 percent, and 100 percent of span for networks that incorporate analog elements, and monitor the resulting outputs to verify compliance to accuracy tolerance requirements.
- 5) Analog output:
 - a) Exercise each field device requiring an analog command signal, through the HMI/SCADA system.
 - (1) Vary the output from the PLC HMI/SCADA system and measure the end device position, speed, etc. to confirm the proper operation of the device for the supplied analog signal.
 - (2) Manually set the output from the HMI/SCADA screen at 0 percent, 25 percent, 50 percent, 75 percent, and 100 percent and measure the response at the final device and at any intermediate devices.

- 6) Submit completed test forms.
 - a) Discrete instrument input devices:
 - (1) Switch setting, contact action, and dead band.
 - (2) Valve position switches:
 - (a) Response in the PLC as the valve is stroked from the PLC.
 - (b) Field observed actual valve position, and valve indicator position as the valve is stroked from the PLC.
 - (3) Operator interface switches (control stations and other pilot devices) and associated response.
 - (4) Starter and drive auxiliary device contact response.
 - (5) Response of all other discrete inputs to the PLC.
 - (6) Test equipment used and associated serial numbers.
 - b) Discrete output devices:
 - (1) Observed response of field device to the discrete output from the PLC.
 - (2) Observe the proper operation of Open, Close, Start, Stop, On, Off, etc.
 - (3) Test equipment used and associated serial numbers.
 - c) Analog input devices:
 - (1) Calibration range.
 - (2) Calibration data: Input, output, and error at each test value.
 - (3) Analog input associated PLC register address.
 - (4) Value in PLC register at each test point.
 - (5) Value displayed at each operator interface station (local operator interface displays and SCADA workstations).
 - (6) Test equipment used and associated serial numbers.
 - d) Analog output devices:
 - (1) Calibration range.
 - (2) Test value at each test point.
 - (3) Analog output associated PLC register address.
 - (4) Control variable value at field device at each test point.
 - (5) Physical device response at each test point:
 - (a) Response to be actual valve position, or motor speed, etc.
 - (6) Test equipment used and associated serial numbers.
 - 7) Failure testing:
 - a) Demonstrate how the system reacts and recovers from abnormal conditions including, but not limited to:
 - (1) Equipment failure.
 - (2) Communications sub-system error.
 - (3) Power failure.
 - (4) Process equipment failure.
 - (5) High system loading conditions.
 - 8) Engineer approval of the CEET submittals is required before proceeding to Functional Testing.
4. Functional testing:
- a. General:
 - 1) Testing to demonstrate proper operation of systems with process equipment operating over full operating ranges under conditions as closely resembling actual operating conditions as possible.

- 2) Performed by Contractor, ICSC, and manufacturer's representative working together, with assistance from the OWNER or the inspection staff, as needed.
 - 3) Additional tests are specified in other Instrumentation and Control Sections.
 - 4) Follow approved detailed test procedures and check lists for Functional Test activities.
- b. Control logic operational validation:
- 1) The purpose of control logic validation is to field test the operation of the complete control system, including all parts of the HMI/SCADA system, all control panels (including vendor control panels), all control circuits, all control stations, all monitored/controlled equipment, and final control elements.
 - 2) Demonstrate control functionality shown on the P&IDs, control schematics, and other drawings, and specified in the loop descriptions, control strategies, Electrical Specifications, and Mechanical Equipment Specifications.
 - 3) Test in detail on a function-by-function and sentence-by-sentence basis.
 - 4) Thoroughly test hardware and software functions.
 - 5) Including all hardwired and software control circuit interlocks and alarms.
 - 6) Test final control elements, controlled equipment, control panels, and ancillary equipment under startup, shut down, and steady-state operating conditions to verify all logic and control is achieved.
 - 7) Control logic validation tests to include, but not limited to: a repeat of all control logic tests from the FAT, modified and expanded to include all field instruments, control panels, circuits, and equipment.
- c. Loop tuning:
- 1) Optimally tune all electronic control stations and software control logic incorporating proportional, integral, or derivative control. Apply control signal disturbances at various process variable levels and adjusting the gain, reset, or rate settings as required to achieve proper response.
 - 2) Verify the transient stability of final control elements operating over the full range of operating conditions, by applying control signal disturbances, monitoring the amplitude and decay rate of control parameter oscillations and making necessary controller adjustments as required to eliminate excessive oscillatory amplitudes and decay rates. As a minimum, achieve 1/4-wave amplitude decay ratio damping (subsidence ratio of 4) under the full range of operating conditions.
 - 3) If excessive oscillations or system instability occur, as determined by the Engineer, continue tuning and parameter adjustments, or develop and implement any additional control algorithms needed to achieve satisfactory control loop operation.
 - 4) Functional validation sheets:
 - a) Document each Functional test on an approved test form.
 - b) Document loop tuning with a report for each loop, including two-pen chart recordings showing the responses to step disturbance at a minimum of 3 setpoints or process rates approved by the Engineer. Show tuning parameters on the

charts, along with time, date, and sign-off by Contractor and Engineer.

- c) Include on the form, functions which can be demonstrated on a loop-by-loop basis:
 - (1) Loop number and P&ID number.
 - (2) Control strategy, or reference to specification tested.
 - (3) Test procedures: Where applicable, use the FAT function-by-function, sentence-by-sentence loop test checklist forms modified to meet the requirements of the Functional test. Otherwise, create new forms.
 - d) For functions that cannot be demonstrated on a loop-by-loop basis (such as overall plant power failure), include on the test form a listing of the specific steps and tests to be conducted. Include with each test description the following information:
 - (1) Specification page and paragraph of function demonstrated.
 - (2) Description of function and/or text from specification.
 - (3) Test procedures: use the FAT loop test checklist forms modified to meet the specific testing conditions of the Functional test.
- 5) Functional certification:
- a) Provide Manufacturer's Certificate of Installation and Functionality Compliance as specified in Section 01756 - Commissioning.
 - (1) Including all test forms with test data entered, submitted to the Engineer with a clear and unequivocal statement that all Functional test requirements have been satisfied.
5. Clean Water Facility Testing:
- a. ICSC shall be onsite to support Clean Water Test activities and provide functional changes as required.
 - b. ICSC shall be onsite to support Clean Water Test activities and provide functional changes as required.

C. Process Start-up Phase:

- 1. Process Start-up:
 - a. Programmer shall be onsite to support Process Start-up activities and provide functional changes as required.
 - 1) ICSC shall be available as needed.
 - b. ICSC shall be onsite to support Process Start-up activities and provide functional changes as required.
- 2. Process Operation Period:
 - a. ICSC shall be available to support Process Operational Period and provide functional changes as required.
 - 1) ICSC shall be available as needed.
 - b. ICSC shall be available to support Process Operational Period and provide functional changes as required.
- 3. PCIS Optimization and Fine-Tuning:
 - a. General:
 - 1) ~~After the Process Operational Period, test PCIS system for additional 60 days as specified in this Section to identify issues and make corrections, as needed. Refer to Section 01756 for commencing and duration of PCIS Optimization and Fine-Tuning.~~^{AD3}

- 2) This is part of the Work that must be completed as a condition of substantial completion and final completion for the entire Project.
- 3) The complete PLC control and HMI/SCADA system must run continuously for the duration of the PCIS Optimization and Fine-Tuning.
- 4) Test and use the entire process control system under standard operating conditions.
- 5) Exercise all system functions.
- 6) Log failure, any system interruption and accompanying component, subsystem, or program failure including time of occurrence, duration of each failure, failure classification, and cause:
 - a) Provide a competently trained technician or programmer on call for the Project Site during all normal working days and hours from the start of the PCIS Optimization and Fine-Tuning until final acceptance of the system.
 - (1) Response time to the Project Site: 24 hours or less, for a major failure.
 - b. SCADA system testing:
 - 1) Exercise each system function, e.g., status report, alarms, logs, and displays several times at a minimum, and in a manner that approximates "normal" system operation.
 - 2) Failure of the HMI/SCADA system during testing shall be considered as indicating that the programs and operating system do not meet the requirements of the specifications.
 - a) Corrective action is required before restarting the PCIS Optimization and Fine-Tuning.

3.07 FIELD QUALITY CONTROL (NOT USED)

3.01 RE-INSTALLATION (NOT USED)

3.02 ADJUSTING (NOT USED)

3.03 CLEANING (NOT USED)

3.04 PROTECTION (NOT USED)

3.05 SCHEDULES

A. Example test forms:

1. Example test forms are attached at the end of this Section. They may be used as a starting point for the development of Project-specific test forms for this Project.
2. The example test forms are not intended to be complete or comprehensive. Edit and supplement the forms to meet the requirements for testing and test forms specified in this Section and other Contract Documents.

END OF SECTION

	FACTORY ACCEPTANCE TEST - CONTROL PANELS	
1. GENERAL INSPECTION A. Structural Inspection <input type="checkbox"/> Verify Lifting Lugs Installed <input type="checkbox"/> Verify enclosure has lock and lock is functional <input type="checkbox"/> Confirm that seismic bracing components are provided per manufacturer's installation instructions B. Exterior Inspection <input type="checkbox"/> Cabinet exterior is clean, scratch, and dent free <input type="checkbox"/> Inspect externally for corrosion and damage <input type="checkbox"/> Verify enclosure door opens and closes easily <input type="checkbox"/> Verify enclosure has a 3-point latch <input type="checkbox"/> Verify enclosure has a flange mounted disconnect (where voltages greater than 120 VAC enter the cabinet) <input type="checkbox"/> Verify enclosure has the appropriate NEMA rating (1, 1G, 12, 3R, 4, 4X, etc.) <input type="checkbox"/> Verify enclosure is the appropriate size (not grossly larger than design, and will still fit in the plant) Nameplates <input type="checkbox"/> Cabinet has identification nameplate <input type="checkbox"/> All door labels are straight, spelled correctly, and match the tagging defined in the Contract <input type="checkbox"/> Cabinet has a nameplate that includes the following: <div style="display: flex; justify-content: space-between; margin-left: 20px;"> <div> <input type="checkbox"/> Power source(s) <input type="checkbox"/> Circuit ID(s) </div> <div> <input type="checkbox"/> Integrator's Logo <input type="checkbox"/> Short Circuit KAIC ratings </div> </div> <input type="checkbox"/> If labels are screwed to door, silicone was utilized to cover screw holes (Labels screwed to the door of a NEMA 4/4X panel technically violates the NEMA rating.) Door Devices <input type="checkbox"/> All devices penetrating the outside of panel have gaskets, silicone or both <input type="checkbox"/> All door devices are installed (HMIs, Pilot Devices, etc.) <input type="checkbox"/> Door mounted equipment is mounted straight and square <input type="checkbox"/> All exterior or door mounted equipment present and accounted for, installed and securely fastened <input type="checkbox"/> NEMA classification has not been violated due to penetrations <input type="checkbox"/> Door mounted equipment has the same NEMA rating as the panel <input type="checkbox"/> All door mounted equipment installed at the correct height <input type="checkbox"/> All door mounted equipment installed in the correct positions and order (layout of door mounted equipment is grouped properly and in a logical manner) <input type="checkbox"/> Doors with multiple penetrations have adequate bracing (if needed) <input type="checkbox"/> Visually check condition of indicators , controllers and annunciators <input type="checkbox"/> Check that pilot lights illuminate correctly <input type="checkbox"/> Check the Push-To-Test function <input type="checkbox"/> Ensure correct pilot light color Peripheral Devices <input type="checkbox"/> Horn / Beacon is installed (where required) <input type="checkbox"/> Silence and Reset pushbutton		
PROJECT NAME: _____ FACILITY NAME: _____ PROCESS AREA: _____ NETWORK ID: _____ WITNESSED BY: _____		TEST DATE: _____ TESTED BY: _____ COMPANY: _____ PAGE: _____ SIGNATURE: _____

	FACTORY ACCEPTANCE TEST - CONTROL PANELS											
<p>1. GENERAL INSPECTION (continued)</p> <p>C. Interior Inspection</p> <p><input type="checkbox"/> Cabinet is cleaned of marks and dirt.</p> <p><input type="checkbox"/> Inspect internally for corrosion and damage.</p> <p><input type="checkbox"/> Back panel is clean of marks and dirt.</p> <p><input type="checkbox"/> Interior of panel vacuumed and shall be free of all debris.</p> <p><input type="checkbox"/> Check that the panel roof is clean and clear of foreign materials.</p> <p><input type="checkbox"/> Bottom of panel has been cut out (where bottom entry is required), with angle iron welded around the bottom perimeter. Re-painting has been performed.</p> <p><input type="checkbox"/> If internal light door limit switch is provided, ensure the light automatically turns "on" when the doors are open.</p> <p><input type="checkbox"/> Check that a document pocket has been provided.</p> <p><input type="checkbox"/> Intrusion alarms (where required).</p> <p>Interior Labeling</p> <p><input type="checkbox"/> All panel mounted equipment has identification labeling, by using either a Brothers or Phenolic type tags.</p> <p><input type="checkbox"/> Verify that door mounted components are mounted square and symmetrical.</p> <p><input type="checkbox"/> Verify that nameplates are straight, legible, and spelled correctly.</p> <p><input type="checkbox"/> All terminal blocks are identified/labeled with permanent labels including tight end blocks and caps.</p> <p><input type="checkbox"/> All wiring shrink labeled and or phased correctly to the specifications.</p> <p><input type="checkbox"/> All wire labels shrunk completely rotated and aligned alike for easy identification.</p> <p><input type="checkbox"/> All fuses and circuit breakers are labeled with ID and current rating.</p> <p><input type="checkbox"/> System Integrator's label or labels installed on door.</p> <p><input type="checkbox"/> Panel manufacturer model/serial number tag is present.</p> <p><input type="checkbox"/> All required safety/warning tags installed and straight.</p> <p><input type="checkbox"/> Correct UL (typically UL 508) or cUL tag installed and registered and all other associated tags installed and straight (the UL tag might not be installed in the panel at the factory test. If the panel is modified due to changes during the factory test or a punch list generated from the factory test, the UL labeling would need to be re-applied. Some UL shops do not apply the UL label until the panel is released to be shipped.).</p> <p>Wireways</p> <p><input type="checkbox"/> Plastic wire way covers installed properly.</p> <p><input type="checkbox"/> Plastic wireways have no sharp edges.</p> <p><input type="checkbox"/> No wire Ties inside the wireways.</p> <p><input type="checkbox"/> No sharp edges on wire ties.</p> <p><input type="checkbox"/> Separation: White duct is used for DC voltages, Gray duct is used for AC voltages.</p> <p><input type="checkbox"/> Ensure wiring duct is not over-full, includes provision for 20% more wiring and the cover may easily be installed. Panduit recommends 50% duct fill, but 40% is a better practice.</p>												
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	FACTORY ACCEPTANCE TEST - CONTROL PANELS											
1. GENERAL INSPECTION (continued) C. Interior Inspection (continued) Wiring <ul style="list-style-type: none"> <input type="checkbox"/> Visually check terminals and condition of internal wirings <input type="checkbox"/> Verify that the control panel has been assembled and wired as designed <input type="checkbox"/> Verify that all components are operational and perform the functions intended <input type="checkbox"/> Verify that all components are sized appropriately for the application <input type="checkbox"/> Verify that equipment control circuits function as intended <input type="checkbox"/> Back of door wiring is labeled and neatly formed <input type="checkbox"/> Back panel to door wiring has sufficient bending radius with spiral wrap <input type="checkbox"/> Wire connection has been verified wired to correct points within the panel <input type="checkbox"/> Individual wires have been given a pull test to verify a good terminal connection <input type="checkbox"/> Wire and cable minimum bending radius have not been violated <input type="checkbox"/> All equipment installed straight and square to back panel <input type="checkbox"/> Wire colors are correct: <ul style="list-style-type: none"> <input type="checkbox"/> Black and White > AC hot and neutral, respectively <input type="checkbox"/> Red > AC control signals <input type="checkbox"/> Blue > DC power and control (Blue w/White stripe for DC ground) <input type="checkbox"/> Yellow > Foreign voltages (those still present when panel power is disconnected) <input type="checkbox"/> Green > AC equipment ground <input type="checkbox"/> Black > TSP (+) <input type="checkbox"/> White > TSP(-) <input type="checkbox"/> Analog wiring shields are continuous (connected by a dedicated terminal block for such shields) <input type="checkbox"/> Analog shield wires are grounded within the panel, where not otherwise grounded at the transmitter itself <input type="checkbox"/> Discrete inputs are separately fused or protected by a circuit breaker on a "per loop" basis <input type="checkbox"/> Intrinsic Safety Wiring <ul style="list-style-type: none"> <input type="checkbox"/> Ensure wiring associated with intrinsic safety circuits or intrinsic safety barriers is kept away from all other wiring by UL minimum distances or by a physical (grounded metal) barrier preventing non-intrinsically safe wiring from coming in contact with intrinsically safe circuits or wiring <input type="checkbox"/> Verify all spare terminals are installed according to the percentage listed in the specifications Grounding <ul style="list-style-type: none"> <input type="checkbox"/> Equipped with "Blackburn" or other grounding type lug <input type="checkbox"/> Lug is securely fastened to the panel structure <input type="checkbox"/> Verify Grounding bar is installed <input type="checkbox"/> Verify Isolated ground bar is installed 												
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PROJECT NAME: _____	TEST DATE: _____											
FACILITY NAME: _____	TESTED BY: _____											
PROCESS AREA: _____	COMPANY: _____											
NETWORK ID: _____	PAGE: _____											
WITNESSED BY: _____	SIGNATURE: _____											

	FACTORY ACCEPTANCE TEST - CONTROL PANELS											
<p>2. POWER TEST</p> <p>A. AC Power</p> <p><input type="checkbox"/> AC Power is routed correctly within the panel, and is isolated from DC and network wiring.</p> <p><input type="checkbox"/> All fuses are installed and sized properly.</p> <p><input type="checkbox"/> All breakers are installed and sized properly.</p> <p><input type="checkbox"/> 24 VDC Power Supplies are functional.</p> <p><input type="checkbox"/> 24 VDC Power fail contacts are functional.</p> <p><input type="checkbox"/> 24 VDC power supplies are redundant, and have diode modules enabling the hot swap-over between supplies.</p> <p style="padding-left: 20px;"><input type="checkbox"/> 24 VDC supplies are equipped with dry contact failure alarms, wired as PLC inputs to signal failure of any DC power supply. Such alarm inputs to the PLC have been tested as being functional.</p> <p><input type="checkbox"/> Dedicated receptacle is wired to receive a dedicated AC supply.</p> <p><input type="checkbox"/> Verify continuity for all DC commons, ground and AC neutrals.</p> <p><input type="checkbox"/> Verify that the CP temporary input power is connected correctly and is the correct voltage.</p> <p><input type="checkbox"/> Close the CP main circuit breaker(s).</p> <p><input type="checkbox"/> Verify that voltages at subsequent circuit breakers are correct.</p> <p><input type="checkbox"/> Close circuit breakers.</p> <p><input type="checkbox"/> Verify that power feeding interruptible and uninterruptible power supplies is correct.</p> <p><input type="checkbox"/> Turn on power supplies if they are not already on.</p> <p><input type="checkbox"/> Verify that voltages at distribution terminals are correct.</p> <p><input type="checkbox"/> Energize any remaining hardware such as the PLC.</p> <p>B. Uninterruptible Power Supply (UPS)</p> <p><input type="checkbox"/> Mounted appropriately within the cabinet, on a dedicated shelf, or rear of a swing-out sub panel.</p> <p><input type="checkbox"/> Is equipped with maintenance bypass switch (or at least plug/receptacle means for bypassing the unit).</p> <p><input type="checkbox"/> Test all UPS alarms (on inverter, failure, battery failure etc.)</p> <p><input type="checkbox"/> Turn off the AC power supply and verify that the UPS will be switched on to supply the designated vital loads in the control panel.</p> <p>3. CONTROLS & AUXILIARY DEVICES TEST</p> <p><input type="checkbox"/> Verify all interposing and auxiliary relays are functioning.</p> <p><input type="checkbox"/> Verify panel lights are functioning.</p> <p>Ventilation and Heating</p> <p><input type="checkbox"/> If ventilation fans are fitted, check the fans operate correctly any associated air filters are clean and not blocked.</p> <p><input type="checkbox"/> Verify components are installed in the correct orientation for proper air flow.</p> <p>4. HARDWIRED INTERLOCK AND SAFETY TEST</p> <p><input type="checkbox"/> Verify that hardwired interlocks through the control panel as shown on schematic drawings are functioning. For example, outlet high pressure switch interlock to a pump.</p> <p><input type="checkbox"/> Verify that all hardwired safety devices through the control panel is functioning. For example, the pull cord emergency stops of conveyors.</p>												
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	FACTORY ACCEPTANCE TEST - CONTROL PANELS											
<p>5. PLC TEST</p> <p>A. Components</p> <p><input type="checkbox"/> PLC interior High Temperature alarm is installed, wired to the PLC, and is shown to be functional.</p> <p><input type="checkbox"/> Relays have transient suppression across their coils. This is particularly important for DC coil relays, where diodes in reverse polarity are often used.</p> <p><input type="checkbox"/> TVSS is installed across the main incoming 120 VAC.</p> <p>PLC and PLC Rack</p> <p><input type="checkbox"/> Verify all cards are securely seated.</p> <p><input type="checkbox"/> Ensure clearance around PLC rack has been met, such that convective heat transfer is not impeded by devices erroneously mounted in the "no encroachment" area. Confirm with manufacturer clearance recommendations.</p> <p>B. PLC I/O Test</p> <p><input type="checkbox"/> Furnish I/O test forms and test all the listed input and output points as follows:</p> <p><input type="checkbox"/> Discrete Inputs: Simulate a field contact closure by "shorting" across the appropriate terminal blocks. Observe the transition between a logical "0" and "1" in the PLC software.</p> <p><input type="checkbox"/> Discrete Outputs: Force the output bit to toggle between logical "0" and logical "1" using the PLC software. Measure contact resistance at the wired terminal blocks using a digital meter selected for the "ohms" setting.</p> <p><input type="checkbox"/> Analog Inputs: Connect a signal generator to the appropriate terminal blocks. Tailor the connection depending on whether a 2-wire or 4-wire simulation is required. Modulate the 4-20mA signal. Observe the associated PLC internal memory register to transition between 0-65535 or if scaled in engineering units, between 0 and the maximum scaled engineering unit. The latter method is preferred.</p> <p><input type="checkbox"/> Analog Outputs: Force the output register to a value between 0-65535 or 0-100%, if the scaling block can be manipulated. Observe the measured 4-20mA value increment and decrement using a digital ammeter.</p> <p>C. Redundant Controllers (where required) Test</p> <p><input type="checkbox"/> Remove Communication cable from primary PLC to verify switching to backup PLC</p> <p><input type="checkbox"/> Remove Communication cable from backup PLC to verify switching back to primary PLC</p> <p><input type="checkbox"/> Remove Power cable from primary PLC to verify switching to backup PLC</p> <p><input type="checkbox"/> Remove Power cable from backup PLC to verify switching back to primary PLC</p> <p>D. PLC Control Logic Verification</p> <p><input type="checkbox"/> The PLC control strategy is verified by following the Control Logic Verification Form based on the specifications. Each control strategy will be verified by simulating the process and checking the state or value of PLC outputs. The results of equipment status and alarms and process instrument values and trends shall also be verified on the Plant SCADA graphic screens stored in a temporary SCADA computer. Since all PLC input and output wiring has been verified and some field devices are not available during Factory Acceptance Testing, certain inputs will be simulated either by means of additional hardware and/or software as described below.</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/> DI states are either simulated by hardwired switches or forced inputs using a programming terminal.</p> <p><input type="checkbox"/> For example, when starters and drives are not provided as part of the contract, jumpers may be installed from the output call relays to the running confirmation inputs to simulate the running state of the motors.</p>												
<table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">PROJECT NAME: _____</td> <td style="width: 40%;">TEST DATE: _____</td> </tr> <tr> <td>FACILITY NAME: _____</td> <td>TESTED BY: _____</td> </tr> <tr> <td>PROCESS AREA: _____</td> <td>COMPANY: _____</td> </tr> <tr> <td>NETWORK ID: _____</td> <td>PAGE: _____</td> </tr> <tr> <td>WITNESSED BY: _____</td> <td>SIGNATURE: _____</td> </tr> </table>			PROJECT NAME: _____	TEST DATE: _____	FACILITY NAME: _____	TESTED BY: _____	PROCESS AREA: _____	COMPANY: _____	NETWORK ID: _____	PAGE: _____	WITNESSED BY: _____	SIGNATURE: _____
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	FACTORY ACCEPTANCE TEST - CONTROL PANELS											
<p>5. PLC TEST (continued)</p> <p>D. PLC Control Logic Verification (continued)</p> <p>Typical Fault Logic</p> <p><input type="checkbox"/> If the fault input is high and the disable (if applicable) for the fault is not high and the common disable (if applicable) is not high begin timing. If any of these conditions changes, stop timing and reset the timer. If the timer reaches its preset, activate the alarm output. If the fault alarm is a shutdown alarm stop the associated motor and latch the alarm so that it remains present even if the condition clears.</p> <p><input type="checkbox"/> The fault condition must return to normal and the alarm must be reset for a latched alarm to clear.</p> <p>Typical Fail to Start Logic</p> <p><input type="checkbox"/> If the motor is called to run (call output high) and no running feedback is received (running input is low) and the fail to start and common alarm disables (if applicable) are not high start timing. If any of these conditions changes, stop timing and reset the timer. If the timer reaches its preset, activate the alarm output, stop calling the motor and latch the alarm.</p> <p>6. HMI OR OIT TEST</p> <p>HMI / OIT Functionality</p> <p><input type="checkbox"/> Communication with PLC</p> <p><input type="checkbox"/> Screen Layouts</p> <p><input type="checkbox"/> Screen Navigation</p> <p><input type="checkbox"/> Set Point Entry</p> <p><input type="checkbox"/> Animation</p> <p><input type="checkbox"/> Color Correctness (Green=Run, Red=Off, Amber=Alarm, or the agreed upon convention)</p> <p><input type="checkbox"/> Alarms</p> <p><input type="checkbox"/> Acknowledge and Reset</p> <p><input type="checkbox"/> Security / Access Levels / Passwords</p> <p>7. NETWORK COMMUNICATION TEST</p> <p>A. Network Components</p> <p><input type="checkbox"/> Fiber optic cabling terminates in a patch panel</p> <p><input type="checkbox"/> Media converters are installed and functional</p> <p><input type="checkbox"/> Terminating resistors have been installed for trunk/tap topologies or where required</p> <p><input type="checkbox"/> Wire and cable bending limitations have not been violated</p> <p>B. Networking Functions</p> <p><input type="checkbox"/> Verify data transfer via the network to different PLCs as shown on the Network Block Diagrams</p> <p><input type="checkbox"/> Verify network traffic rate and error margin is acceptable</p>												
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	FACTORY ACCEPTANCE TEST - CONTROL PANELS			
<p>8. FAT DOCUMENTATION AND RECORD</p> <p>Panel Documentation</p> <ul style="list-style-type: none"> <input type="checkbox"/> As-built panel drawings showing actual panel construction and devices arrangement and c/w Bill of Material. <input type="checkbox"/> Panel schematic and interconnection drawings. <input type="checkbox"/> P&ID drawings and schematic drawings for the process area controlled by the panel that is to be tested. <input type="checkbox"/> I/O list test forms of the process area to be tested. <input type="checkbox"/> FAT procedure of the process area to be tested. <input type="checkbox"/> Test record forms of the process area to be tested. Forms shall include area for signature of responsible test personnel. <input type="checkbox"/> Hard copy of the PLC application program of the process area to be tested. <input type="checkbox"/> Hard copy of the HMI/OIT graphic screens of the process area to be tested. <p>9. FAT TOOLS AND SOFTWARE</p> <ul style="list-style-type: none"> <input type="checkbox"/> Simulation software if required <input type="checkbox"/> Digital volt meter Fluke 87 <input type="checkbox"/> Process meter Fluke 787 <input type="checkbox"/> Laptop computer with PLC application program <input type="checkbox"/> Temporary SCADA computer with HMI software and applicable graphic screens <input type="checkbox"/> Jumper wires 				
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> PROJECT NAME: _____ FACILITY NAME: _____ PROCESS AREA: _____ NETWORK ID: _____ WITNESSED BY: _____ </td> <td style="width: 50%; vertical-align: top;"> TEST DATE: _____ TESTED BY: _____ COMPANY: _____ PAGE: _____ SIGNATURE: _____ </td> </tr> </table>			PROJECT NAME: _____ FACILITY NAME: _____ PROCESS AREA: _____ NETWORK ID: _____ WITNESSED BY: _____	TEST DATE: _____ TESTED BY: _____ COMPANY: _____ PAGE: _____ SIGNATURE: _____
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	INSTALLATION AND CERTIFICATION CHECKLIST DOCUMENTATION	
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INSTRUMENT LOOP NO. _____

SERVICE DESCRIPTION _____

A COPY OF LATEST ISSUE OF THE FOLLOWING DOCUMENTS ARE INCLUDED IN THIS INSTRUMENT INSTALLATION CERTIFICATION FILE:

- ☐ INSTRUMENT SPECIFICATION SHEETS (FOR ALL INSTRUMENTS IN THE LOOP)
- ☐ INSTRUMENT INSTALLATION DETAILS (FOR ALL INSTRUMENTS IN THE LOOP)
- ☐ INSTRUMENT LOOP WIRING DIAGRAMS
- ☐ INSTRUMENT INSTALLATION CERTIFICATION CHECKLIST
- ☐ SIZING CALCULATIONS
- ☐ INSTRUMENT INSTALLATION SCHEDULE (APPLICABLE PART)
- ☐ NAMEPLATE SCHEDULE (APPLICABLE PART)
- ☐ VENDOR LITERATURE CALIBRATION INFORMATION

☐ ☐

INSTRUMENT LOOP IS PART OF EQUIPMENT START-UP/SHUTDOWN INTERLOCKS?

No Yes

REMARKS: _____

CHECKED BY (COMPANY) _____ ACCEPTED BY (COMPANY) _____

SIGNATURE _____ SIGNATURE _____

DATE _____ DATE _____

	SWITCHES INSTALLATION AND CALIBRATION CHECKLIST	
--	--	--

INSTRUMENT LOOP NO. _____

SERVICE DESCRIPTION _____

CHECK BELOW, WHEN COMPLETED:

- ☐ BENCH CALIBRATED PER SPECIFICATION SHEET NO. _____
- ☐ VERIFIED PER P&ID NO. _____
- ☐ CORRESPONDS TO SPECIFICATION SHEET NO. _____
- ☐ WIRING CORRECT PER INSTRUMENT LOOP DRAWING NO. _____
- ☐ INSTALLATION CORRECT PER DETAIL NO. _____
- ☐ ACCESSORIES ARE PRESENT AND PROPERLY INSTALLED
- ☐ INSTRUMENT IS ACCESSIBLE FOR MAINTENANCE OR REMOVAL
- ☐ ENGRAVED LAMINATED NAMEPLATE (NO SPELLING ERRORS) PERMANENTLY INSTALLED

☐ ☐

INSTRUMENT LOOP IS PART OF EQUIPMENT START-UP/SHUTDOWN INTERLOCKS?

No Yes

<u>FIELD CALIBRATION CHECK</u>						
CONTACT NO.	FUNCTION	FOR SIGNAL	CONTACT IS TO	AT SPECIFIED VALUE FOR	ACTUAL TRIP POINT WAS	
1	<input type="checkbox"/> ALARM	<input type="checkbox"/> INCR	<input type="checkbox"/> OPEN	SET PT = _____	SET PT = _____	
	<input type="checkbox"/> S/D PERM	<input type="checkbox"/> DECR	<input type="checkbox"/> CLOSE	RESET = _____	RESET = _____	
2	<input type="checkbox"/> ALARM	<input type="checkbox"/> INCR	<input type="checkbox"/> OPEN	SET PT = _____	SET PT = _____	
	<input type="checkbox"/> S/D PERM	<input type="checkbox"/> DECR	<input type="checkbox"/> CLOSE	RESET = _____	RESET = _____	
3	<input type="checkbox"/> ALARM	<input type="checkbox"/> INCR	<input type="checkbox"/> OPEN	SET PT = _____	SET PT = _____	
	<input type="checkbox"/> S/D PERM	<input type="checkbox"/> DECR	<input type="checkbox"/> CLOSE	RESET = _____	RESET = _____	
4	<input type="checkbox"/> ALARM	<input type="checkbox"/> INCR	<input type="checkbox"/> OPEN	SET PT = _____	SET PT = _____	
	<input type="checkbox"/> S/D PERM	<input type="checkbox"/> DECR	<input type="checkbox"/> CLOSE	RESET = _____	RESET = _____	

NOTE: PERM IS ABBREVIATION FOR PERMISSIVE

	TRANSMITTER/CONTROLLER/INDICATOR INSTALLATION AND CALIBRATION CHECKLIST	
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☐ ☐
 INSTRUMENT LOOP IS PART OF EQUIPMENT START-UP/SHUTDOWN INTERLOCKS? No Yes

INSTRUMENT TYPE ☐ TRANSMITTER ☐ CONTROLLER ☐
 INDICATOR ☐ OTHER DESCRIPTION _____

INSTRUMENT TAG NO. _____ SERIAL NO. _____

SERVICE DESCRIPTION _____

<u>BENCH CALIBRATION CHECK</u>				
INPUT RANGE = _____ HEAD CORRECTION = _____ CALIBRATED SPAN = _____			OUTPUT RANGE = _____ <input type="checkbox"/> LINEAR <input type="checkbox"/> SQUARE ROOT	
% CALIB SPAN	DESIRED VALUE	ACTUAL VALUE	EXPECTED VALUE	ACTUAL VALUE
0				
50				
100				

CHECK BELOW, WHEN COMPLETED:

- ☐ BENCH CALIBRATED PER SPECIFICATION SHEET NO. _____
- ☐ VERIFIED PER P&ID NO. _____
- ☐ CORRESPONDS TO SPECIFICATION SHEET NO. _____
- ☐ WIRING CORRECT PER INSTRUMENT LOOP DRAWING NO. _____
- ☐ INSTALLATION CORRECT PER DETAIL NO. _____
- ☐ ACCESSORIES ARE PRESENT AND PROPERLY INSTALLED
- ☐ INSTRUMENT IS ACCESSIBLE FOR MAINTENANCE OR REMOVAL
- ☐ ENGRAVED LAMINATED NAMEPLATE (NO SPELLING ERRORS) PERMANENTLY INSTALLED

<u>FIELD CALIBRATION CHECK</u>				
INPUT RANGE = _____			OUTPUT RANGE = _____	
% CALIB SPAN	DESIRED VALUE	ACTUAL VALUE	EXPECTED VALUE	ACTUAL VALUE
0				
50				
100				

	TRANSMITTER/CONTROLLER/INDICATOR INSTALLATION AND CALIBRATION CHECKLIST	
--	--	--

- ☐ DIRECT ☐ REVERSE
☐ ACTION VERIFIED AT 50% SPAN
☐ ACTION VERIFIED AT _____ SPAN

CONTROLLER SETTINGS								
SETTING	GAIN	PB	RESET (INTEGRAL)	DERIV. (RATE)	HIGH LIMIT	LOW LIMIT	ELEV. ZERO	ZERO SUPP
PRE-TUNE								
POST-TUNE								

PRE-TUNE SETTINGS					
	GAIN	PB	RESET (REPEAT/MIN)	RESET (MIN/REPEAT)	DERIVATION (MINUTES)
FLOW	1.0	100	10	0.1	N/A
LEVEL	1.0	100	MIN.	MAX.	N/A
PRESSURE	2.0	50	2.0	0.5	N/A
TEMP.	4.0	25	0.1	10	OFF

REMARKS _____

CHECKED BY (COMPANY) _____ ACCEPTED BY (COMPANY) _____

SIGNATURE _____ SIGNATURE _____

DATE _____ DATE _____

	ANALYZERS INSTALLATION AND CALIBRATION CHECKLIST	
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☐ ☐

INSTRUMENT LOOP IS PART OF EQUIPMENT START-UP/SHUTDOWN INTERLOCKS?

No Yes

TYPE OF INSTRUMENT _____

INSTRUMENT TAG NO. _____ SERIAL NO. _____

SERVICE DESCRIPTION _____

CHECK BELOW, IF TRUE

☐ BENCH CALIBRATED PER SPECIFICATION SHEET NO. _____

☐ VERIFIED PER P&ID NO. _____

☐ CORRESPONDS TO SPECIFICATION SHEET NO. _____

☐ WIRING CORRECT PER INSTRUMENT LOOP DRAWING NO. _____

☐ INSTALLATION CORRECT PER DETAIL NO. _____

☐ ACCESSORIES ARE PRESENT AND PROPERLY INSTALLED

☐ INSTRUMENT IS ACCESSIBLE FOR MAINTENANCE OR REMOVAL

☐ ENGRAVED LAMINATED NAMEPLATE (NO SPELLING ERRORS) PERMANENTLY INSTALLED

REMARKS _____

CHECKED BY (COMPANY) _____ ACCEPTED BY (COMPANY) _____

SIGNATURE _____ SIGNATURE _____

DATE _____ DATE _____

	CONTROL VALVES INSTALLATION AND CALIBRATION CHECKLIST	
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☐ ☐

INSTRUMENT LOOP IS PART OF EQUIPMENT START-UP/SHUTDOWN INTERLOCKS?

No Yes

- ☐ VALVE TAG NO. _____ SERIAL NO. _____
- ☐ TRANSDUCER TAG NO. _____ SERIAL NO. _____
- ☐ SOLENOID TAG NO. _____ SERIAL NO. _____
- ☐ VOLUME BOOSTER TAG NO. _____ SERIAL NO. _____
- ☐ POSITIONER _____ SERIAL NO. _____

SERVICE DESCRIPTION _____

TRANSducer CHECK					
INPUT RANGE =			OUTPUT RANGE =		
CALIBRATED SPAN =			CALIBRATED SPAN =		
BENCH					
SPAN	DESIRED	ACTUAL	SPAN	EXPECTED	ACTUAL
0%			0%		
50%			50%		
100%			100%		
FIELD					
SPAN	DESIRED	ACTUAL	SPAN	EXPECTED	ACTUAL
0%			0%		
50%			50%		
100%			100%		

CHECK BELOW, IF TRUE:

- ☐ BENCH CALIBRATED PER ABOVE _____
- ☐ VERIFIED PER P&ID NO. _____
- ☐ CORRESPONDS TO SPECIFICATION SHEET NO. _____
- ☐ VALVE SPECIFICATION NO. _____
- ☐ TRANSDUCER SPECIFICATION NO. _____
- ☐ SOLENOID SPECIFICATION NO. _____
- ☐ WIRING CORRECT PER INSTRUMENT LOOP DRAWING NO. _____
- ☐ INSTALLATION CORRECT PER INSTRUMENT INSTALLATION DETAILS _____
- ☐ VALVE DETAIL NO. _____
- ☐ TRANSDUCER DETAIL NO. _____
- ☐ SOLENOID DETAIL NO. _____

	CONTROL VALVES INSTALLATION AND CALIBRATION CHECKLIST	
--	--	--

- ☐ ACCESSORIES ARE PRESENT AND PROPERLY INSTALLED
- ☐ INSTRUMENT IS ACCESSIBLE FOR MAINTENANCE OR REMOVAL
- ☐ ENGRAVED LAMINATED NAMEPLATE (NO SPELLING ERRORS) PERMANENTLY INSTALLED

VALVE CHECK			
FLOW CHECK	<input type="checkbox"/> PROCESS FLOW DIRECTION THROUGH THE VALVE IS CORRECT		
SAFETY CHECK	ON LOSS OF AIR VALVE FAILS <input type="checkbox"/> OPEN <input type="checkbox"/> CLOSE		ON LOSS OF POWER SOLENOID FAILS <input type="checkbox"/> TO VENT <input type="checkbox"/> TO VALVE
TRAVEL CHECK	FULL OPEN AT _____ PSI	FULL CLOSED AT _____ PSI	MEASURED TRAVEL _____ INCHES
SEATING CHECK	<input type="checkbox"/> ON BENCH <input type="checkbox"/> IN-LINE	RESULTS	ACTUATOR BENCH SET
POSITIONER CHECK			
VALVE FULL OPEN AT _____ PSI TO POSITIONER			
VALVE FULL CLOSED AT _____ PSI TO POSITIONER			
VOLUME BOOSTER CHECK			
BYPASS VALVE (GAIN) ADJUSTING SCREW BACKED OUT _____ TURNS FROM CLOSED TO ENSURE QUICK BUT STABLE OPERATION (TYPICALLY 1-1/2 TO 2 TURNS)			

REMARKS _____

CHECKED BY (COMPANY) _____ ACCEPTED BY (COMPANY) _____

SIGNATURE _____ SIGNATURE _____

DATE _____ DATE _____

Network Power SuppliesPower Supply Equipment

- ☐ ODVA compliant
☐ Quantity and ratings

Supply Source (120 VAC)

- ☐ Overcurrent protection
☐ Conductor size

Network Power Tap (24 VDC)

- ☐ Overcurrent protection
☐ Conductor size

Comments:

CHECKED BY (COMPANY)

ACCEPTED BY
(COMPANY)

SIGNATURE

SIGNATURE

DATE

DATE

^{AD3} Addendum No. 3

APPENDIX B^{AD3}

DRAFT STANISLAUS COUNTY ENCROACHMENT PERMIT



STANISLAUS COUNTY
DEPARTMENT OF PUBLIC WORKS
1010 10th Street, Suite 4204
Modesto, CA 95354
Phone: (209) 525-4130
Fax: (209) 525-6507
pwpermits@stancounty.com
<http://www.stancounty.com/publicworks/>

ENCROACHMENT PERMITS

►What is the purpose of an Encroachment Permit?

The purpose of an encroachment permit is to enable the County to monitor work or activities performed within County road right-of-ways by home owners, private developers, contractors, utility companies and local governmental agencies. A request for a road closure and/or road detours also requires an Encroachment Permit.

Issuing the permit assures that the work or activities performed in the encroachment area will be done in accordance to the Public Works Standard Designs and Specifications 2007 Edition, in accordance to the requirements of the Stanislaus County Code and to the project's Conditions of Approval, if any (i.e. in association to a Building Permit, Use Permit, Tentative /Vested/Final Subdivision Map, Development Plans for off-site street improvements, etc).

►When is an Encroachment Permit required?

An Encroachment Permit is required for all construction work and proposed activities that encroach within, under, or over the County road right-of-ways. Some examples of work requiring an Encroachment Permit may include but are not limited to the following:

- Excavations
- Installation of sidewalk
- Installation of driveways
- Installation of curb & gutter
- Monuments and surveys
- Public utility installation, maintenance, and repair (i.e. AT&T, PG&E, Cable TV)
- Installation of part-width or full-width street improvements
- Storm drain installations and/or connections
- Sanitary sewer installations and/or connections
- Water services and water main installations and/or connections
- Monitoring well (installation, monitoring and/or abandonment)

An Encroachment Permit is also required for road closures or road detours for construction work or activities that may impede the traveling public. Prior to any road closures or detours, a copy of a traffic control plan must be reviewed and approved by the County Traffic Division before an Encroachment Permit is issued.

►Do I need an Encroachment Permit for surface or overhead installation in County roadways?

It depends. Unless you are working under a franchise agreement, an Encroachment Permit is required for surface or overhead installation in County roadways. Any person having permission (i.e. a franchise or other authority of law) to install such surface or overhead installations shall do so by first consulting with and fully advising the Encroachment Inspector.



**STANISLAUS COUNTY
DEPARTMENT OF PUBLIC WORKS**

1010 10th Street, Suite 4204
Modesto, CA 95354
Phone: (209) 525-4130
Fax: (209) 525-6507
pwpermits@stancounty.com
<http://www.stancounty.com/publicworks/>

► **Is it against the law to perform work in the County right-of-ways without obtaining an Encroachment Permit?**

Yes. According to the Stanislaus County Code (Chapter 13.04 EXCAVATIONS AND INSTALLATIONS), it is unlawful for any person not having a franchise or other authority of law to perform any activity or construction work in the County's road right-of-ways without authorization from the County Road Commissioner. It is also unlawful to make any excavation in or upon any county highway or other public place or to construct, install, or make a new or different use of any siphon, bridge, pipeline, conduit or similar structure in, along, upon or across any county highway, or other public place without first obtaining an Encroachment Permit.

► **How & where do I apply for an Encroachment Permit?**

You can apply for an Encroachment Permit online or by visiting the permitting office located at 1010 10th Street, Modesto, CA 95354, Suite 4204. You may also contact 209-525-7594 for general Encroachment Permit information or to schedule an appointment.

The permit application can be found on the County web site located at:

<http://www.stancounty.com/publicworks/pdf/EncroachmentApplication.pdf>

► **What are the Steps in Applying for an Encroachment Permit?**

There are currently six basic steps in obtaining an Encroachment Permit through the Stanislaus County's permitting department. The process begins by submitting an application to the Encroachment Engineer and ends after the one-year warranty period of the installed improvements (if any). Typically the warranty period begins after the Encroachment Inspector has signed off on the permit and accepted the improvements. The six steps are summarized below:

1. **Application Submittal:** The applicant or permittee will submit a completed application along with any required construction plans and traffic control plans.
2. **Review & Approval:** Depending on the type of project, the Encroachment Engineer may either review and approve the application or refer the application to the Traffic and Engineering Divisions for a more in-depth review to determine if all design standards have been met and to ensure safety to the public.

Depending on the scope and detail of the work or activity to be performed, supporting documentation (such as plans, profiles, topography, environmental documentation, drainage calculations, will serve letters, surety bonds, and/or liability insurance) may be required.
3. **Permit Issuance:** Upon permit approval and payment of permit fees, the Encroachment Engineer will issue the approved Encroachment Permit to the applicant.
4. **Construction Inspection:** The applicant will need to contact the Encroachment Inspector to request an inspection. When calling to schedule an inspection, the applicant must provide the permit number, job address, contact person's name, telephone number, and type of inspection to be performed.

The Encroachment Inspector's contact information can be found on your encroachment permit.



**STANISLAUS COUNTY
DEPARTMENT OF PUBLIC WORKS**

1010 10th Street, Suite 4204
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All work performed within County Road right-of-ways shall be inspected by the Encroachment Inspector. The Encroachment Inspector will need to be notified 48-hours prior to beginning any construction work.

5. **Final Improvement Acceptance:** The Encroachment Inspector will sign-off and accept the improvements once all the work or activities have been performed per the conditions of the permit.

6. **One-Year Warranty:** The applicant warrants all of the improvements as to material quality and workmanship for one year. Should any failure of the improvements or any part thereof occur within a period of one year after the final acceptance date, the applicant shall make the needed repairs as directed by the Encroachment Inspector without any incurring expense or cost to the County.

► **How long will it take to process an Encroachment Permit application?**

The Encroachment Engineer will either approve or deny an Encroachment Permit Application upon determination that the application submittal is complete or incomplete. The Encroachment Engineer has the authority in what constitutes a completed Encroachment Permit Application submittal. The actual time needed to review and approve the application will depend on the completeness of the initial submittal, scope of the work, and the level of complexity of the proposed work.

Most simple permits can typically be issued over-the-counter. However, permits that are more complex may require additional time to perform and coordinate adequate plan review with the County Engineering Design and Traffic Divisions.

► **How much does an Encroachment Permit cost?**

The basic Encroachment Permit fee is \$40.00 and covers the administration and permit processing charges. Additional cost may be applicable to the permit to cover plan reviews, field reviews, construction inspections, re-inspections (if required), National Pollutant Discharge Elimination System (NPDES) storm water quality review, and other fees as determined by the Encroachment Inspector.

The total cost will be determined in accordance to the latest [Fee Schedule](#) adopted by the Board. The fee schedule can be found at the following website:

www.stancounty.com/publicworks/pdf/fee-schedule.pdf

Fees may vary depending on the type of encroachment that is requested. For larger projects (i.e. full street improvements, subdivision type work, etc...) a financial security deposit may be required.

The permit application shall be accompanied by a personal check, certified check, cashier's check, letter of credit, performance bond executed in favor of the county by a surety company or, other payment method acceptable to the Encroachment Inspector. The check should be made out and payable to "Stanislaus County". The amount shall be in a sum not less than the amount estimated in the application as the cost of faithfully performing all work to be done under the permit applied for, and conforming to all conditions or restrictions which may be specified in the permit.



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In lieu of the payment required with each application, any applicant may make a blanket deposit in a form and amount acceptable to the Encroachment Engineer. Any remaining funds in the deposit balance will be returned to the applicant or exonerated by the Encroachment Inspector at the end of the one-year warranty period.

Please note that currently Stanislaus County does not accept credit card payments for Encroachment Permits.

► **What does the Encroachment Permit Application consist of?**

The Stanislaus County Code requires that all applications for permits shall be made in writing in such form as may be prescribed by the Road Commissioner. The current Permit Application Form adopted by the Road Commissioner is available online at the following web site:

<http://www.stancounty.com/publicworks/pdf/EncroachmentApplication.pdf>

At a minimum, the Encroachment Permit application shall show the following items:

1. A description for the necessity of performing encroachment work or activity within a County's road right-of-ways.
2. A brief description of the proposed work or activity to be performed.
3. Location of the proposed encroachment work or activity.
4. Estimated time necessary to complete the proposed encroachment work or activity.
5. Proposed date of commencement of work or activity.
6. Estimated date of completion of work or activity.
7. Estimated cost for the proposed work or activities to be performed.
8. Photographs of the crossing and street around the work site, if available.
9. Improvement plans or a drawing of the work site, if required. Minor permits typically do not require plans (i.e. for constructing driveway approaches, sidewalks, bell holes, installation of sewer lateral repairs, water main connections, etc). However, for larger or more complex projects, the Encroachment Permit may require construction improvement plans that have been prepared by a licensed Civil Engineer (i.e. for utility trenching, installation/maintenance of water/sewer/storm drain main lines and services, street improvements, subdivision improvements, etc).
10. The Encroachment Permit fee, as determined by the Encroachment Engineer, shall be paid.
11. A Certificate of Liability Insurance must be provided (or be on file with the Encroachment Engineer) at the time the permit is issued.
12. A contractor must have possession of a current and valid state license certifying either a Class A certification or a certification as a Specialty Contractor for the type of work performed (as defined by the Business & Professions Code Division 3, Chapter 9. Contractors, Article 4 "Classifications").

► **Do I need liability insurance in order to obtain an Encroachment Permit?**

Yes. A Certificate of Liability Insurance must be provided (or be on file with the Encroachment Engineer) at the time the permit is issued. The applicant or contractor shall provide a Certificate of Insurance with general liability insurance of single coverage of \$1,000,000 (which is typically the minimum amount of coverage needed for large and complex projects such as full road improvements or underground trench construction). However, for smaller and less complex projects, the amount of liability coverage required



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may be less. On certain occasions, a Home Owner Insurance policy may also be used depending on the type of work performed and scope of the project (i.e. driveway installations, curb & gutter, etc). The amount of the liability insurance necessary for your permit will be determined by the Encroachment Engineer at the time the Encroachment Permit is applied for.

Said policy shall name the Stanislaus County as an additional insured (A separate endorsement sheet may be required with the insurance policy and the location and job description must be included on the policy).

At a minimum, the Certificate of Liability Insurance must show the policy number; policy effective date; policy expiration date; dates of the insurance coverage; the dollar amount of the liability coverage; the insurance company name; and the name of the insured company. The certificate can be sent via email, surface mail or fax by the insurance company or broker, or can be presented over-the-counter by the applicant pulling the permit.

► Do I need to possess a State Contractor License to perform construction work or activity in the County Right-of-Ways?

Yes. The applicant or contractor performing the work must possess a current state license certifying a Class A certification (or a certification as a Specialty Contractor as defined by the Business & Professions Code Division 3, Chapter 9. Contractors, Article 4. "Classifications"). The applicant or contractor performing the work shall also comply with Section 3800 of California Labor Code.

The following licenses are acceptable for the scope of work as described. All other class licenses will only be issued a permit upon approval by the County Road Commissioner.

- C8 Concrete Contractor may perform driveway approach and sidewalk project.
- C12 Earthwork and Paving Contractors may perform grading work.
- C16 Fire Protection Engineering Contractors may perform installation of fire service lines.
- C27 Landscaping Contractors may perform landscaping related work.
- C31 Construction Zone Traffic Control Contractor for traffic control
- C32 Parking and Highway Improvement Contractors may perform parking lot pavement work including installation of protective vehicle signage and/or device.
- C34 Pipeline Contractor may perform water and gas line work including trenching, compacting and surface paving.
- C42 Sanitation System Contractors may perform sanitary sewer line work including trenching, compacting and surface paving. Under no circumstance shall the C36 Plumbing Contractors be allowed to perform sewer line work in the public right-of-ways.
- C57 Water Well Drilling Contractor may perform installation and repairs of water wells and pumps by boring, drilling, excavating, casing, cementing and cleaning to provide a supply of uncontaminated water.

Please note that the State of California only allows the "owner" of a property or a licensed contractor to obtain an Encroachment Permit.

► Is an Inspection required?



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Yes. The Encroachment Inspector shall have the right to inspect the work or activity to be performed within the County right-of-ways and to prescribe any and all conditions pertaining to such work or activity.

Written notice or a telephone call/message shall be provided to the Encroachment Inspector not less than two work days (48-hours) prior to the commencement of any work under the permit granted unless the date of commencement has been specified in the application or permit.

The permittee shall be responsible for all liability for personal injury or property damage which may arise out of work permitted and done under a permit or which may arise out of failure on the permittee's part to perform his or her obligations under any permit in respect to public safety and traffic control. In the event any claim of liability is made against the County, or any department, officer, or employee therefore, permittee shall defend, indemnify and hold them and the County harmless from such claim.

►Who is responsible for maintaining the work or activity during the Encroachment period?

Unless the improvements are accepted by the County, the permittee shall remain responsible for maintaining the work or activities performed in the encroached area(s). The permittee may also be required to execute a maintenance agreement with the County to provide for future maintenance associated with the Encroachment Permit improvements. The agreement shall be in a form provided by the County and accepted on behalf of the County by the Road Commissioner.

►Is a Traffic Control Plan required?

It depends. The Encroachment Engineer may require a traffic control plan to be submitted along with the permit application depending on the type of work or activity to be performed in the road right-of-ways. The traffic plan may require warning signs, lights, appropriate control devices, flagmen, or other items to help control and direct the flow of traffic.

Pursuant to Vehicle Code Section 21367, the Road Commissioner or designee may restrict the use of and regulate the movement of traffic through or around areas affected by construction, maintenance, or repair of any county roadway while engaged in the performance of such work whenever the traffic would endanger the safety of workers or the work would interfere with or endanger the movement of traffic through the area.

The applicant or permittee that is pulling the permit is responsible for the public safety and traffic control during the encroachment work period and until acceptance of the improvements by the County. Unless otherwise expressly permitted by the Encroachment Inspector, the permittee shall maintain access to traffic over, upon, and across the county roadways and approaches so as not to hinder, render inconvenient, or interfere with the public use of the right-of-ways.

An Encroachment Permit is also required for road closures or road detours for construction work or proposed activities that may impede the traveling public. Prior to any road closures or detours, a copy of a traffic control plan must be reviewed and approved by the County Traffic Division before an Encroachment Permit is issued.



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All construction traffic control shall conform to the latest edition of the California Manual of Uniform Traffic Control Devices (CAMUTCD). These standards can be found at Caltran's website located at

www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/index.htm

► **Does my work need to be constructed in compliance to any standards?**

Yes. All Encroachment Permits issued in Stanislaus County shall comply with the requirements of the Stanislaus County Department of Public Works Standard & Specifications – 2007 Edition (Standards). These standards can be found at the following website:

www.stancounty.com/publicworks/pdf/2007_imp_stand.pdf

► **Will I be required to install and maintain erosion and sediment control Best Management Practices (BMPs) if I am not required to file for a Notice of Intent (NOI) with the State Regional Water Quality Control Board (SRWQCB)?**

Yes. Although the applicant may be exempt from filing a NOI and/or obtaining a Waste Discharge Identification Number (WDID), the applicant will still be responsible for managing and controlling erosion and sediment from the work site. The encroachment work shall be done in accordance to the [Stanislaus County Storm Water Management Plan](#) and the [Stanislaus County Storm Water Discharge Ordinance](#) as described in [County Code Section 14.14](#).

The storm water management plan and discharge control ordinance can be found at the following web address under the "Helpful Downloads" section:

www.stancounty.com/publicworks/storm

If a permit is required under the National Pollutant Discharge Elimination System (NPDES) program, all construction shall be done in accordance to the project's Storm Water Pollution Prevention Plan (SWPPP).

► **Who do I contact if...**

- I have questions regarding my Encroachment Permit application?
- I need to submit additional information/documentation?
- I need a time extension (rider)?

For more information on questions relating to the Encroachment Permit process, please visit our permitting office located at 1010 10th Street, Modesto, CA 95354, Suite 4204.

You may also contact (209) 525-4130 for general Encroachment Permit information.



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Call USA North 1-800-227-2600
Two (2) working days prior to excavating, digging, or in an emergency



ENCROACHMENT/CONSTRUCTION PERMIT

Stanislaus County Department of Public Works
Development Services

1010 10th Street, Suite 4204, Modesto, CA 95354

Phone:(209)525-4130 Fax:(209)525-6507

E-mail: pwpermits@stancounty.com

Permit No: ENCR -

Application Date:
Inspection Fee:

Billing Status: ☐ Paid in Full
☐ To Be Billed
☐ Fee Waived

Applicant:					
Purpose:					
Site Description				APN#:	
Site Address:	City:	State:	CA	Zip:	
Mailing Address:	City:	State:	CA	Zip:	
Telephone:	Email:				

CAMS No:

Deposit:

Receipt #:

Liability Insurance? ☐

License No:

Status: Pending ☐ Active ☐
Issued ☐ Closed ☐

Start:

Anticipated End Date:

Final Acceptance:

☐ PMA ☐ Annual Blanket Permit ☐ PGE Specific? ☐ TDN Required? ☐ Major Permit ☐ Minor Permit ☐ Minimal Permit

The undersigned is hereby applying for a permit to work in the Public right-of-way at the following locations, subject to the provisions required by Streets and Highways Code 1450-1496 and the Stanislaus County Encroachment Permit Conditions as shown on the back of this permit and made a part of here to. In addition, the applicant will adhere to any special conditions and the general conditions as specified below:

1. Construction shall be done in accordance to County Standards and California Storm Water Pollution Prevention Plan (SWPPP) Best Management Practices (BMP).
2. Applicant shall be responsible for maintaining liability insurance in the amount shown above. A liability insurance certificate policy shall be provided prior to any construction activity.
3. All construction traffic control shall conform to the California Manual on Uniform Traffic Control Devices (CAMUTCD) and per-approved detour plan.
4. All construction plans (if required) must be attached with permit.
5. Road Closures will require approval from County Traffic Division. Any impacts to traffic will require a 48 hour advance notice to the Traffic Engineer.
6. Please see Conditions page which must be attached to the permit at all times.
7. Please call inspector 48 hours in advance of a change of the start date or in advance of beginning work.
8. This permit is valid for six months from date of issuance.

ASSIGNED INSPECTOR:

☐ Mylars Required ☐ Mylars Received ☐ As-builts Received?

Plans: TC Plans:

Lat: Long: Map

☐ Project in NPDES Red Zon
☐ ESCP Required?
☐ Post-Develop. Req?
☐ SWPPP Req?

ESCP Review Date:
Post-Dev. Review Date:
SWPPP Review Date:

Encroachment / Construction Permit Fee Item	Quantity	Fee	Total
Excavation Permit Fee	0	\$40	\$0.00
Excavation Inspection Fee (per 500 ft in unpaved areas)	0	\$190	\$0.00
Excavation Inspection Fee (per 250 ft in paved areas)	0	\$190	\$0.00
Encroachment Permit Fee for Driveway Construction	0	\$190	\$0.00
Utility Trench Cuts (\$7.30/sf, for roads with PCI rating > 50)	0	\$7.30	\$0.00
Construction Permit Fee	0	\$60	\$0.00
Curb Gutter (per 250 LF)	0	\$190	\$0.00
Sidewalk (per 250 LF)	0	\$190	\$0.00
Matching Pavement	0	\$190	\$0.00
Pipeline Maintenance Agreement	0	\$285	\$0.00
Improvement Plan Review	0	\$105	\$0.00
General Construction Inspection Services	0	\$95	\$0.00
Erosion and Sediment Improvement Plan (ESCP) - Plan Review	0	\$95	\$0.00
Erosion and Sediment Control Plan (ESCP) - Field Inspections	0	\$95	\$0.00
Traffic Control Review and Traffic Delay Notification	0	\$190	\$0.00
Road Closure Fee	ADT= 0	No. of Days: 0	\$500
NPDES Permit Review (Risk Level 1 = \$450, Risk Level 2 = \$675, Risk Level 3 = \$855)			\$0.00
Total Encroachment Permit Fee:			\$0.00

Project Risk Level:

Project Construction Type:

Inspection Frequency:

Project-Size: 0.00 acres
Disturbed-Area: 0.00 acres

Utility Trench Calcs

Surface Type:
Length: ft
Width: ft
Trench Area: sq-ft
PCI (0-100):

The undersigned is hereby applying for a permit to work in the Public right-of-way at the site address as shown on this permit, subject to the provisions required by Streets and Highways Code 1450-1496 and the following permit conditions as noted below:

STANISLAUS COUNTY ENCROACHMENT PERMIT CONDITIONS

1. **ACCEPTANCE OF THE PROVISIONS:** It is understood and agreed by the Permittee that all conditions have been read, and understood. The Permittee agrees to comply with all conditions.
2. **KEEP PERMIT ON WORK SITE:** This permit, or a complete copy, shall be kept at the site of the work and upon request must be shown to any County representative or law enforcement officer.
3. **PERMITS FROM OTHER AGENCIES:** Permittee must obtain all other permits required by other public or private agencies or individuals necessary in order to perform the intended work. It shall be the responsibility of the Permittee to notify the utility and cable TV companies prior to starting any construction that may involve their underground or overhead utilities.
4. **INSURANCE:** Owners, developers or contractors must provide certificates of insurance in an amount of at least \$1,000,000 or as determined by the Department.
5. **BONDS:** A cash deposit, performance bond, letter of credit or other approved form of security shall be submitted in an amount equal to 100% of the value of the work performed within the County right of way or easement.
6. **INSPECTION NOTIFICATION:** The Permittee shall notify the Department of Public Works Encroachment Inspector assigned to this project, shown on page 1, a minimum of two (2) working days prior to performance of any work under this permit. Any work performed without inspection or contrary to Stanislaus County Public Works Standard Construction Specifications, Standard Details or approved plans shall be deemed non-complying and will not be accepted by the County.
7. **TRAFFIC CONTROL:** Construction traffic control shall conform to the current edition of the "California Manual on Uniform Traffic Control Devices", as published by the State of California, Department of Transportation.
8. **PERMIT EXPIRATION:** This permit is valid for a period of six months as measured from the construction start date or until liability insurance expires, whichever comes first, unless otherwise specified on Page one under General Notes.
9. **UNDERGROUND SERVICE ALERT:** Permittee must notify Underground Service Alert (USA) at 800-642-2444 or 1-800-227-2600 at least 48 hours in advance of start of work for location of underground utilities.
10. **GUARANTEE:** For a period of one year after acceptance by the Department of Public Works, the Permittee shall guarantee all work performed under this permit. Any failure caused by defective materials or workmanship shall be promptly repaired or replaced at the Permittee's expense. Failure of the Permittee to make such corrections will cause the County to make or have made any necessary repairs at the Permittee's expense.
11. **STORAGE OF MATERIAL:** Excavated material, sand, gravel, or any construction materials and debris shall not be stockpiled in the County right-of-way.
12. **PUBLIC CONVENIENCE:**
 - (a) The Permittee shall conduct his operations as to offer the least obstruction and inconvenience to the public and abutting property owners. The Permittee shall have under construction no greater amount of work than he can properly secure at the end of the workday with due regard to the safety of the public.
 - (b) Unless otherwise provided in the permit, all public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible.
 - (c) The Permittee at his expense shall remove spillage resulting from hauling operations along or across any publicly traveled way immediately.
 - (d) Convenient access to driveways, houses, and buildings along the work shall be maintained and temporary approaches to crossings or intersecting highways shall be provided and kept in good condition. When the abutting property owner's access across the right-of-way line is to be eliminated, or to be replaced under the permit by other access facilities, the existing access shall not be closed until the replacement access facilities are usable.
 - (e) Standard work hours will be 7:00am to 5:00pm, Monday through Friday, Unless pre-approved by County Engineer and listed on page 1 of this permit under General Notes.
 - (f) If ordered by the Inspector, water shall be supplied by the Permittee to alleviate or prevent dust nuisance.
13. **SAFETY:**
 - (a) General - The Permittee shall be solely and completely responsible for the conditions of the job site, including safety of all persons and property during performance of the work. This requirement shall not be limited to normal working hours. Safety provisions shall conform to all applicable Federal, State, and local laws, ordinances, and codes, and to the rules and regulations established by the California Division of Industrial Safety, and to other rules of law applicable to the work.
 - (b) The services of the Inspector in conducting construction review of the Permittee's performance is not intended to include review of the adequacy of the Permittee's work methods, equipment, bracing or scaffolding or safety measures, in, on, or near the construction site, and shall not be construed as supervision of the actual construction nor make the Inspector or the County responsible for providing a safe place for the performance of work by the Permittee, Contractor, subcontractors, or suppliers; or for access, visits, use work, travel or occupancy by any person.
 - (c) The Permittee shall instruct all personnel working in potentially hazardous work areas as to potential dangers and shall provide such necessary safety equipment and instruction as is necessary to prevent injury to personnel and damage to property. Special care shall be exercised relative to electrical work, work involving excavation and in sump pump work.
 - (d) All work and materials shall be in strict accordance with all applicable State, Federal and local laws, rules, regulations, and codes.
 - (e) Nothing in this permit is to be construed to permit work not conforming to governing law.
 - (f) Shoring and Trench Safety Plan - Attention is directed to Section 832 of the Civil Code of the State of California, Section 6705 of the State Labor Code, and the Construction Safety Orders of the State of California Division of Industrial Safety.
14. **PROTECTION OF PERSON AND PROPERTY:**
 - (a) The Permittee shall take whatever precautions are necessary to prevent damage to all existing improvements, including above ground and underground utilities, trees, shrubbery that is not specifically shown to be removed, fences, signs, mailboxes, survey markers and monuments, buildings, structures, the County's property, adjacent property, and any other improvements or facilities within or adjacent to the work. If such improvements or property are injured or damaged by reason of the Permittee's operations, they shall be replaced or restored, at the Permittee's expense, to a condition at least as good as the condition they were in prior to the start of the Permittee's operations.
 - (b) The Permittee shall adopt all practical means to minimize interference to traffic and public inconvenience, discomfort or damage. The Permittee shall protect against injury to any pipes, conduits or other structures crossing the trenching or encountered in the work and shall be responsible for any injury done to such pipes or structures, or damage to property resulting there from. He shall support or replace any such structures without delay.
 - (c) The Permittee shall pay the entire expense of replacing the highway in as good condition as before.
15. **RESPONSIBILITY FOR REPAIR OF FACILITIES:** All public or private facilities, including but not limited to, gravel surfacing at existing canals, structures, telephone cables, roadways, curbs, gutters, parking lots, private drives, levees and embankments for creeks, ponds and reservoirs disturbed during construction of the work shall be repaired and/or replaced by the Permittee to match facilities existing prior to construction. In addition, the Permittee shall be responsible for any settlement damage to such facilities or adjoining areas for a period of one year after acceptance of such
16. **COUNTY'S REPAIR:** In the event the Permittee refuses or neglects to make good any loss or damage for which he is responsible under this permit, the County may itself, or by the employment of others, make good any such loss or damage, and the cost and expense of doing so, including any reasonable engineering, legal and other consultant fees, and any costs of administrative and managerial services, shall be charged to the Permittee.
17. **CONTRACTOR'S LICENSE NOTICE:** Contractors are required by law to be licensed and regulated by the Contractor's State License Board. Any questions concerning a contractor may be referred to the registrar, Contractor's State License Board, 9821 Business Park Dr., Sacramento, California or by visiting www.cslb.ca.gov or by calling 1-800-321-CSLB (2752).
18. **INDEMNITY AND LITIGATION COST:**
 - (a) The Permittee specifically obligates himself and hereby agrees to protect, hold free and harmless, defend and indemnify the County, the Engineer, his consultants, and each of their officers, employees and agents, from any and all liability, penalties, costs, losses, damages, expenses, causes of action, claims or judgments, including attorney's fees, which arise out of or are in any way connected with the Permittee's, his Contractor's, or his subcontractors' or suppliers' performance of work under this permit. To the extent legally permissible, this indemnity and hold harmless agreement by the Permittee shall apply to any acts or omissions, whether active or passive, on the part of the Permittee or his agents, employees and representatives, resulting in liability irrespective of whether or not any acts or omissions of the parties to be indemnified hereunder may also have been a contributing factor to the liability.
 - (b) In any and all claims against the County or the Engineer and his consultants, and each of their officers, employees and agents by any employee of the Permittee, his Contractor, any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification of obligation under this Section shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under Workmen's Compensation status, disability benefit statutes, or other employee benefit statutes.
19. **MONUMENT PRESERVATION PROTECTION:** Contractor is responsible for preservation and/or perpetuation of all existing monuments which control subdivisions, tracts, boundaries, streets, highways, easements, or other right-of-way, easements, or provide survey control which will be disturbed or removed due to contractor's work. Contractor shall provide a minimum of 10 working days notice to project engineer/surveyor prior to disturbance or removal of existing monuments. Project engineer/surveyor shall coordinate with contractor to reset monuments or provide permanent witness monuments and file the required documentation with the County Surveyor pursuant to Business and Professional Code section 8771.

I, the undersigned, certify that I have read and understand the entire permit (page 1 and 2) and will abide by the conditions and requirements as set forth.

Signed By:

Permit Issue Date

Approved by County Road Commissioner (CRC): David Leamon

Permit Issued by:

July 9, 2021 - Addendum No. 3

Pre-Construction

Acknowledgement of Survey Monument Preservation

Monument Preservation prior to construction activity

I, _____, a Landowner or Contractor with _____
(Please Print) (Company)
performing work within Stanislaus County Right-of-Way hereby acknowledge my responsibility
for monument preservation as required per Sections 8771(a-f) of the Business and Professions
Code, within my scope of work and the bounds of the construction activity permitted by the
Stanislaus County Encroachment Permit No. ENCR _____ - _____.

Basic Permit Information

Applicant:

Purpose:

Site Description:

Site Address

Proposed Start Date:

Proposed End Date:

Stanislaus County Public Works has performed a cursory monument check for Encroachment
Permit No. ENCR _____ - _____ and has FOUND / NOT FOUND monuments that could be
disturbed with the proposed work. Please note that the Landowner/Contractor performing the
work remains responsible for any monument disturbance. If a monument is disturbed,
notify Stanislaus County Surveyor's Office immediately at (209)525-4130.

Signature of Landowner/Contractor

Date

EROSION & SEDIMENT CONTROL PLAN CHECKLIST



PROJECT NAME: _____
 PROJECT ID: _____
 ENCR PERMIT NO: _____

ESCP REVIEW DATE: _____

SITE CONDITIONS: Weather: ☐ Clear ☐ Partly Cloudy ☐ Light Rain ☐ Heavy Rain ☐ Hail or Snow

Wind: ☐ None ☐ Less than 5 mph ☐ Greater than 5 mph

Temperature (°F): _____ °F

FOR INSPECTOR'S USE ONLY
 Inspection Checklist for BMP
 Maintenance: Non-Compliance

	BMP Fact Sheet	Use as Needed	STORM WATER BEST MANAGEMENT PRACTICES (BMPs)	Pre Inspection	Monthly	Post Inspection
EROSION CONTROL	EC-1	<input type="checkbox"/>	Scheduling (work will be conducted during the dry season: May 1 through September 30)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	EC-2	<input type="checkbox"/>	Preservation of Existing Vegetation (existing vegetated areas will not be disturbed)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	EC-4	<input type="checkbox"/>	Area to be vegetated with landscaping, turf, or hydroseeding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	EC-7	<input type="checkbox"/>	Temporary Erosion Control using an erosion control blanket or geotextile	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	EC-6 & EC-8	<input type="checkbox"/>	Area covered with a temporary or permanent mulch including straw, wood, compost, hydromulch, or equivalent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	EC-16	<input type="checkbox"/>	Non-Vegetated Stabilization (covered with aggregate, paving, permanent structures / surfaces)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	WE-1	<input type="checkbox"/>	Wind Erosion Control (keep soil moist to prevent wind erosion)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TEMPORARY SEDIMENT CONTROL	SE-1	<input type="checkbox"/>	Temporary Silt Fence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	SE-2 or SE-3	<input type="checkbox"/>	Sediment basin or trap (retention pond or basin where sediment can settle out)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	SE-5	<input type="checkbox"/>	Temporary Fiber Rolls / Straw Wattles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	SE-6 or SE-8	<input type="checkbox"/>	Temporary Gravel Bag Berm or Sand Bag Barrier	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	SE-7	<input type="checkbox"/>	Street Sweeping. No raking, blowing, or sweeping of sediment, trash or grass clippings into streets, gutters, or catch basin inlets/drains. Inspect roads, sidewalks daily. Clean and maintain as necessary.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	MS4 Standard	<input type="checkbox"/>	Curb cutback (4 inches of elevation difference between the disturbed soil and the top of the existing curb, sidewalk, or paved surface)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	SE-10	<input type="checkbox"/>	Temporary Drain Inlet Protection (mandatory for any DI's within 50 feet of the project)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	SE-13	<input type="checkbox"/>	Compost Socks / Biofilter Bags	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	TC-1	<input type="checkbox"/>	Stabilized Construction Exit – Constructed with 3" to 6" aggregate at the project owner's specification, but it must be effective in controlling trackout.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	TC-2	<input type="checkbox"/>	Stabilized Construction Roadways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	WM-03	<input type="checkbox"/>	Stockpile Management (stockpiles not actively used in the last 14 days must be covered with an erosion control blanket or plastic sheeting and contained with a fiber roll or gravel bag berm)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NON STORM WATER POLLUTION CONTROL	NS-3	<input type="checkbox"/>	Paving, Sealing, Saw-cutting, Coring, and Grinding Operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	NS-7	<input type="checkbox"/>	Potable Water / Irrigation Testing / Landscape Irrigation Runoff Discharge to the Municipal Drainage System	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	NS-8	<input type="checkbox"/>	Vehicle and Equipment Cleaning Performed on Site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	NS-9 & WM-04	<input type="checkbox"/>	Vehicle and Equipment Fueling Performed on Site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	NS-10	<input type="checkbox"/>	Vehicle and Equipment Maintenance Performed on Site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	NS-12, NS-13 & WM-08	<input type="checkbox"/>	Concrete, Stucco, Plaster, Tile, or Masonry Work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	WM-05 & WM-09	<input type="checkbox"/>	Temporary Sanitary Waste Facilities (port-a-potties). Keep all Waste Bins/Lids Covered at End of Each Work Day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	WM-01	<input type="checkbox"/>	Storage of Hazardous Materials on the Project Site (paints, solvents, acids, fuel, lubricants, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Onsite ESCP / SWPPP Inspection Assessment (check one):

- ☐ ESCP / SWPPP is satisfactory and no revisions needed.
☐ ESCP / SWPPP is satisfactory with minor revisions noted below.

- ☐ ESCP / SWPPP is not satisfactory and requires corrections noted below.
☐ ESCP / SWPPP is in violation of County Ordinance 14.14 as noted below.

Inspection Notes: _____

Signed By: _____

Signed Date: _____

Inspected By: _____

Inspection Date: _____



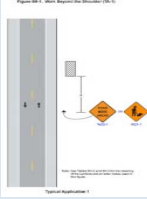
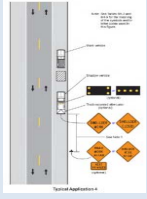
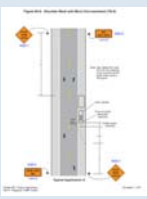

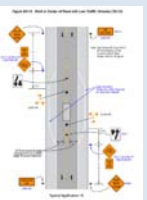
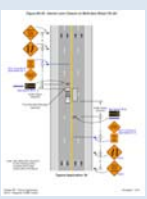

**STANISLAUS COUNTY DEPARTMENT OF PUBLIC WORKS
DEVELOPMENT SERVICES DIVISION
1010 10th Street, Suite 4204, Modesto, CA 95354
Phone: (209)525-4130 Fax: (209)525-6507
E-mail: pwpermits@stancounty.com**

SITE INFORMATION:

ESCP Reviewed by: _____

ESCP Review date _____

ENCROACHMENT PERMIT NO: _____		
PROJECT NAME: _____		
SITE ADDRESS: _____		
SITE CITY: _____	STATE: _____	ZIP: _____

Selected?	TCP ID:	Diagram of TCP	Figure_Desc	Traffic Control Plan Notes & Conditions:
<input type="checkbox"/>	6H-1		Work Beyond the Shoulder	
<input type="checkbox"/>	6H-3		Work on the Shoulders	
<input type="checkbox"/>	6H-6		Shoulder Work with Minor Encroachment	
<input type="checkbox"/>	6H-10		Lane Closure on Two-Lane Road Using Flaggers	
<input type="checkbox"/>	6H-15		Work in Center of Road with Low Traffic Volumes	
<input type="checkbox"/>	6H-30		Interior Lane Closure on Multi-lane Street	
<input type="checkbox"/>	6H-46		Work in the Vicinity of a Grade Crossing	

Signed By _____

Date _____

City of Turlock Surface Water Distribution Project
DRAFT Project-Specific Encroachment Permit Conditions of Approval

Proposed Updates: May 19, 2021

1. Prior to permit issuance, a detailed construction schedule shall be provided along with the contractor's certificate of liability insurance.
2. A pipeline maintenance agreement (PMA) will be provided prior to issuance of the encroachment permit.
3. A traffic control plan shall be submitted and approved by Stanislaus County prior to any permit issuance. A notice shall be submitted to the County no later than 48 hours prior to any traffic delay. All full road closures will require prior approval and a minimum fees of:
 - a. Quincy Road: Zeering to Monte Vista: \$1,000/day
 - b. Quincy Road: Monte Vista to City Limit: \$1,500/day
 - c. Zeering Road: City Limits to Quincy: \$1,500/day
 - d. Monte Vista Ave: City Limits to Quincy: \$3,500/day
4. All construction traffic control shall conform to the California Manual on Uniform Traffic Control Devices (CAMUTCD) and per the approve detour plan.
5. Road closures will require approval from County Traffic Division. Any impact to traffic will require a 48-hour advance notice to the Traffic Engineer.
6. Applicant shall be responsible for maintaining liability insurance. A liability insurance certificate policy shall be provided prior to any construction activity.
7. Pavement spoils and recycling of asphalt concrete from existing roadbed may be used to construct the shoulders or as road sub-base. The use of reclaimed asphalt for road base is only allowed when the material meets the requirements in the Caltrans Standard Specification Section 26 for Class 2 Aggregate Base.
8. The asphalt concrete shall conform to the requirements of Stanislaus County Standards and Specification, Chapter 3.12 for Type A asphalt concrete.
9. The applicant shall submit for approval by the County pavement design calculations utilizing the Caltrans Flexible Asphalt Concrete Pavement Design method for road reconstruction. The design values shall be based on traffic indices (Table I) per Table 3-2 Stanislaus County Standards and Specifications. Road classifications are along these alignments are:

Table 1. County Road Designation and Traffic Control Plan Speed		
Road Name	Road Designation	Traffic Control Plan Speed
Quincy Road	Major Collector	55 mph/Rural
Zeering	Other Principal Arterial	55 mph/Rural
E Monte Vista	Minor Arterial	55 mph/Rural

10. The applicant shall submit its already completed soils report listing soils R-values along the alignment.
11. Construction shall be performed in accordance to County MS4 Phase II Standards and California Storm Water Pollution Prevention Plan (SWPPP) Best Management Practices (BMP).
12. Please call inspector 48 hours in advance of a change of the start date or in advance of beginning work.
13. A minimum of 4 feet of cover will be maintained from the top of proposed, finished grade to the top of the new pipeline.
14. The applicant is responsible for notifying all property owners with frontage along the alignments of the project 30 calendar days in advance of construction that the pipeline is being installed in the County Road and of any impacts and access issues arising from that construction.
15. Permanent pothole repair will be made by construction of a partial depth or deep path that completely removes the affected area and replaces with new AC and base materials in accordance with Caltrans guidelines contained in "Appendix B, Guidelines for Identifying and Repairing Localized Areas of Distress in AC Pavements Prior to Capital Preventative Maintenance or Rehabilitation Repairs", as found at the link below, unless the area is subsequently trenched by the Contractor for a new pipeline:

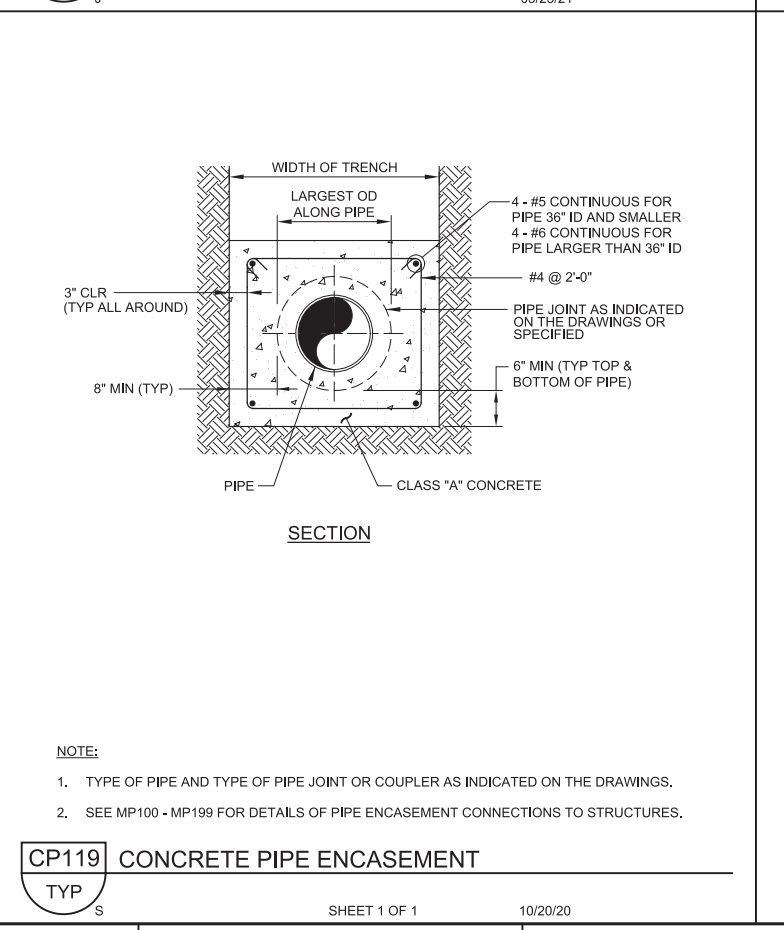
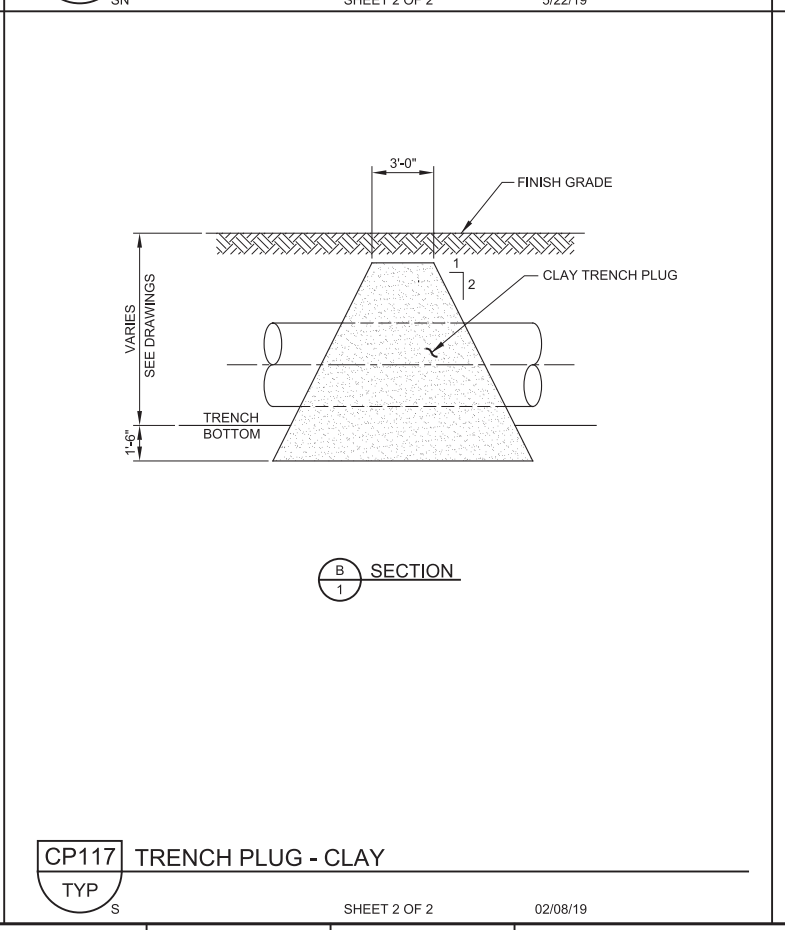
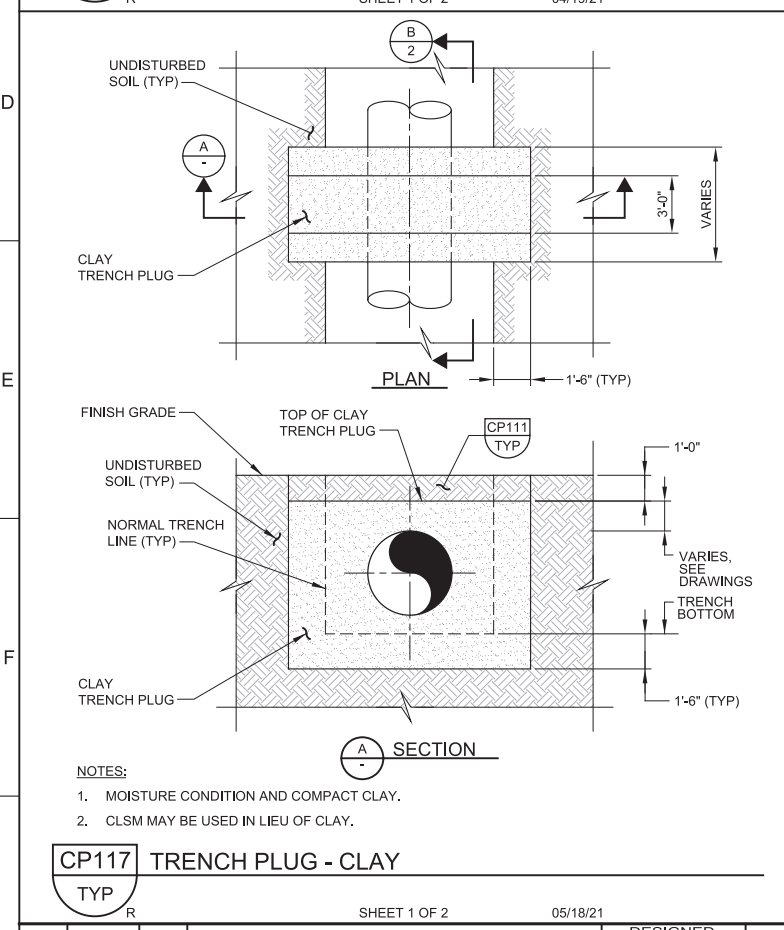
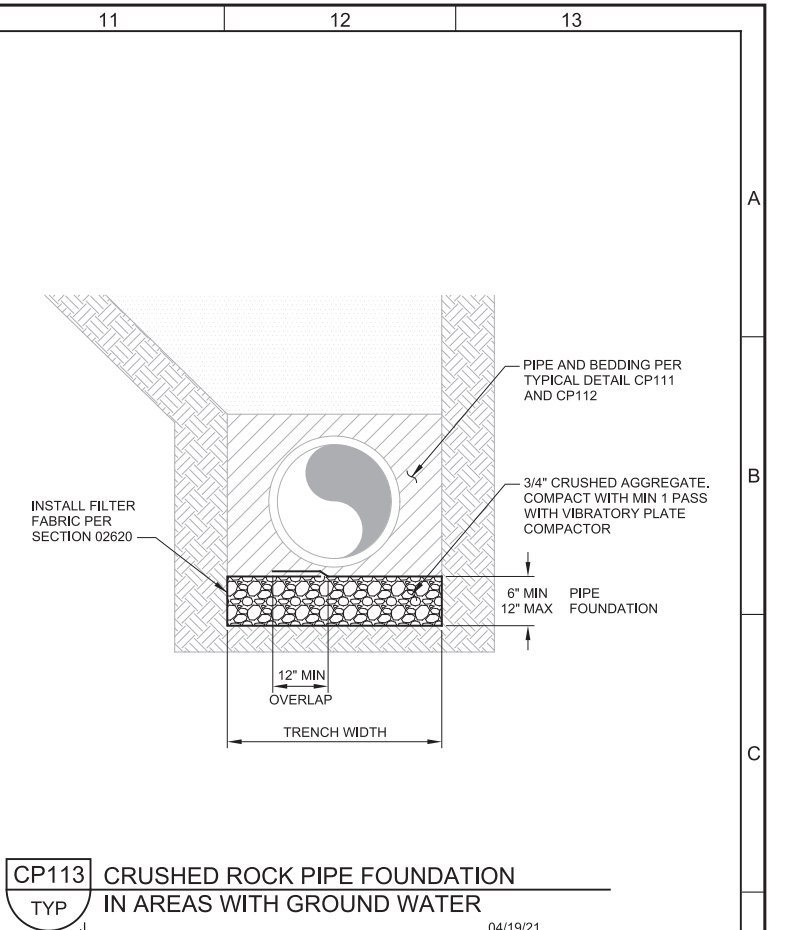
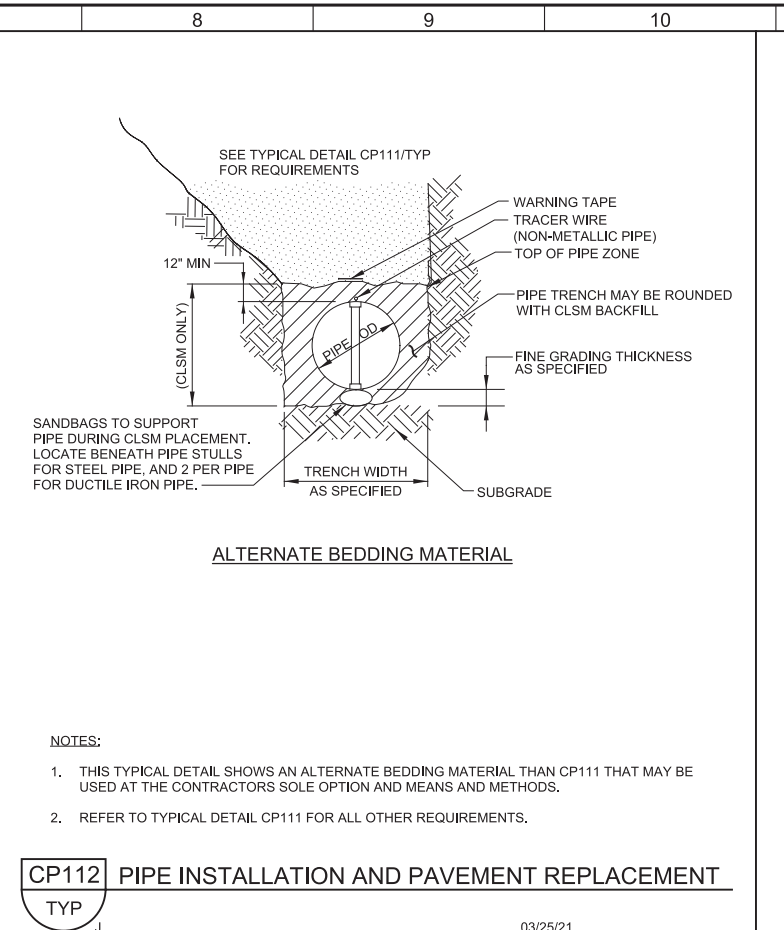
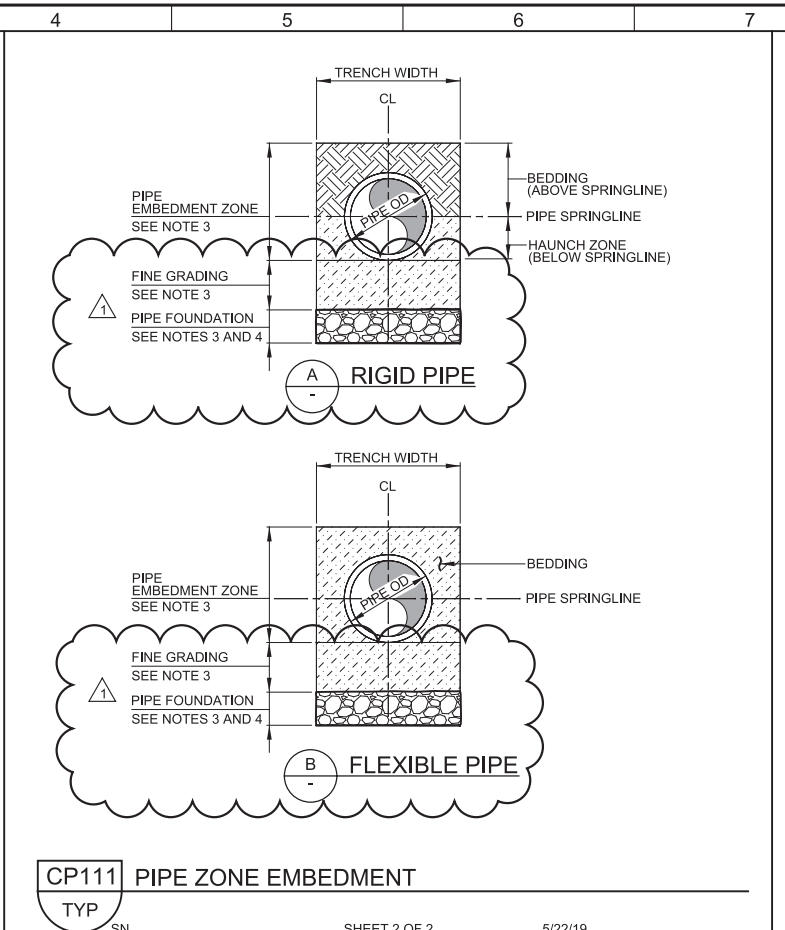
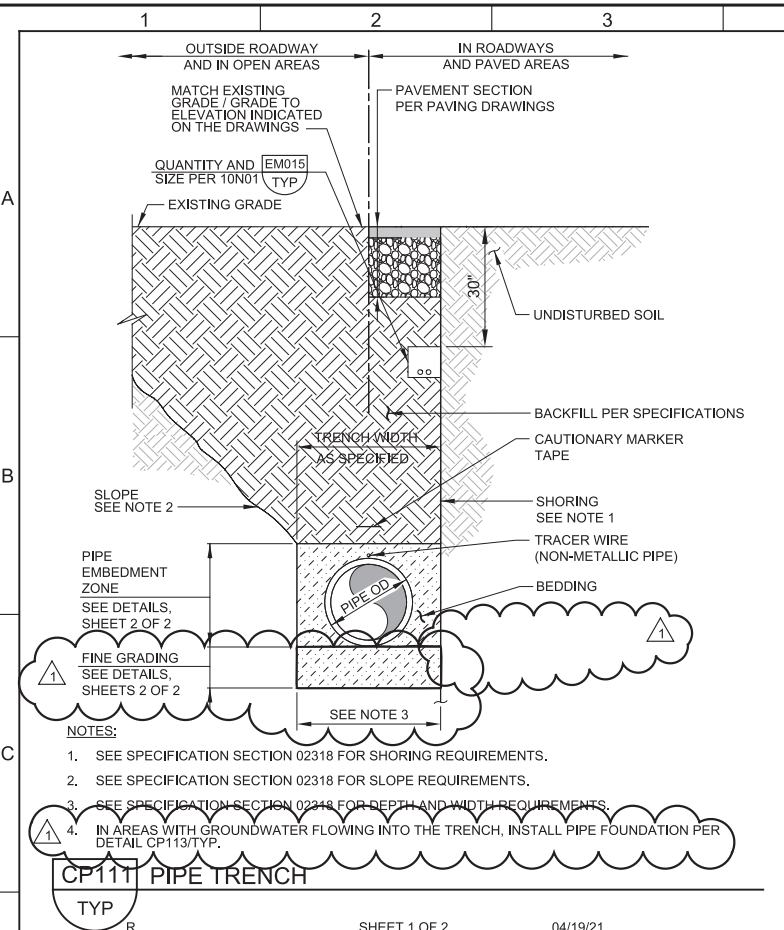
http://dot.ca.gov/hq/maint/Pavement/Offices/Pavement_Engineering/PDF/guidelines-for-ac-pavements.pdf
16. In lieu of reconstructing the existing roads to meet the minimum AASHTO design standards, roads will be reconstructed as indicated per the following requirements:
 - a. Quincy Road From Zeering Road to Terminal Tank Site:
 - i. Facilities: SRWA 42" Potable Pipeline, Turlock 24" Potable Pipeline, and Turlock 15" Storm Drain

- ii. Final Paving will be designed and installed by SRWA and the requirements for paving will be listed in SRWA's encroachment permit conditions.
 - iii. If for some reason SRWA does not perform paving, the City will perform the required paving.
- b. Quincy Road from Terminal Tank Site south to County/Turlock jurisdiction limit
 - i. Facilities: Turlock 42" Potable Pipeline
 - ii. Paving Requirements:
 - 1. Lane where pipeline is located: Reconstruct with 0.45-inch Hot Mix Asphalt (HMA) over 0.55-inch Aggregate Base (AB) per County standards to a width of 10 feet from the existing centerline.
 - 2. Lane where pipeline is not located: Mill 2-inches of existing asphalt and fill with 2-inches of HMA to the limits of the existing pavement.
 - 3. Install 1 foot wide AB shoulder on each side of the road to the depth of the HMA and AB road structural section.
- c. Zeering Road from County/Turlock jurisdiction limit to Quincy Road
 - i. Facilities: Turlock 16" Potable Pipeline and Turlock 15" Storm Drain
 - ii. Paving Requirements:
 - 1. Lane where pipelines are located: Reconstruct with 0.45-inch Hot Mix Asphalt (HMA) over 0.55-inch Aggregate Base (AB) per County standards to a width of 10 feet from the existing centerline.
 - 2. Lane where pipeline is not located: Mill 2-inches of existing asphalt and fill with 2-inches of HMA to the limits of the existing pavement.
 - 3. Install 1 foot wide AB shoulder on each side of the road to the depth of the HMA and AB road structural section.
- d. Monte Vista Road from County/Turlock jurisdiction limit to Quincy Road
 - i. Facilities: Turlock 16" Potable Pipeline
 - ii. Paving Requirements:
 - 1. Lane where pipeline is located: Reconstruct with 0.45-inch Hot Mix Asphalt (HMA) over 0.55-inch Aggregate Base (AB) per County standards to a width of 10 feet from the existing centerline.
 - 2. Lane where pipeline is not located: Mill 2-inches of existing asphalt and fill with 2-inches of HMA to the limits of the existing pavement.
 - 3. Install 1 foot wide AB shoulder on each side of the road to the depth of the HMA and AB road structural section.

17. In lieu of the Trench Cut Fee, the entire lane shall be reconstructed for the lane that is trenched and destroyed. Travel lanes that are not excavated but are located adjacent to trench areas will be repaired if they are significantly damaged during construction.

18. Temporary steel plate bridging will be installed in accordance with the Caltrans Encroachment Permits Manual Section 602.5C, Temporary Steel Plate Bridging-- With a Non-Skid Surface. For roads with speed limits of 45 mph or greater, Method 1 will be applied. For roads with speed limits less than 45 mph, Method 2 will be applied.
19. Controlled low strength material (CLSM) will be permitted for use as trench backfill when the material meets the following strength requirements:
- a. 100 psi – 200 psi
20. Pavement striping locations to match existing with new striping material per current County standards.
21. Pipeline backfill will be permitted with native material to 95% relative compaction per the County's standard 3-H1 for construction in new streets. Backfill with Class II AB and controlled low strength material (CLSM) will be permitted.

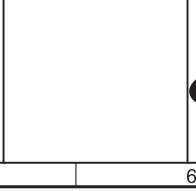
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DESIGNED CE				
DRAWN CE				
CHECKED MD				
DATE JUNE 2021				
REV	DATE	BY	DESCRIPTION	
1	7/9/21	JPM	CHANGED PER ADDENDUM NO. 3	



Digitally signed by Jonathan P. Marshall
Contact info: Carollo Engineering, Inc.
Date: 2020.07.09 11:21:29 -0700



STANISLAUS COUNTY, CALIFORNIA

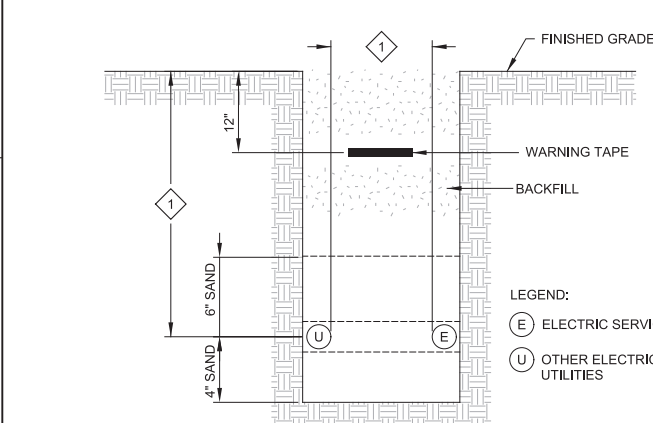
CITY OF TURLOCK PROJECT NO. 18-69 SURFACE WATER DISTRIBUTION SYSTEM IMPROVEMENTS PROJECT		VERIFY SCALES BAR IS ONE INCH ON ORIGINAL DRAWING 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	JOB NO. 11380B.10 DRAWING NO. 00TC02 SHEET NO. 26 OF 213
TYPICALS TYPICAL DETAILS CIVIL 2			

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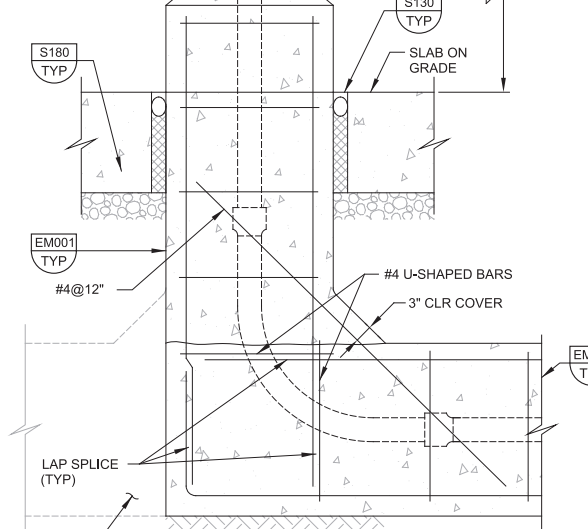
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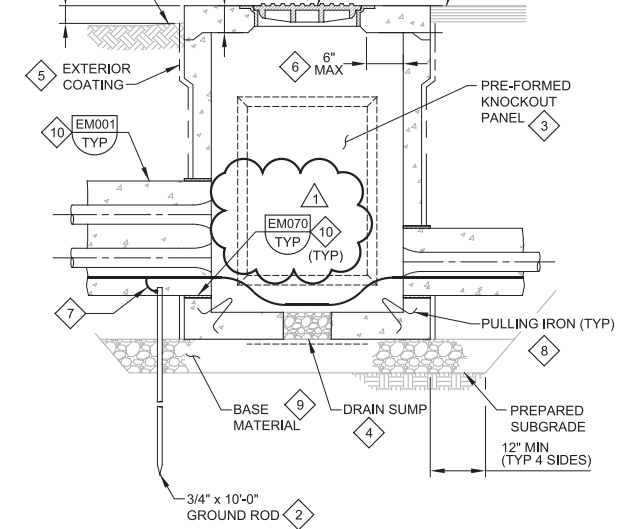
KEY NOTES:
1 DIMENSIONS PER SERVING UTILITY REQUIREMENTS.

EM016 TYPICAL UTILITY TRENCH DETAIL
TYP S



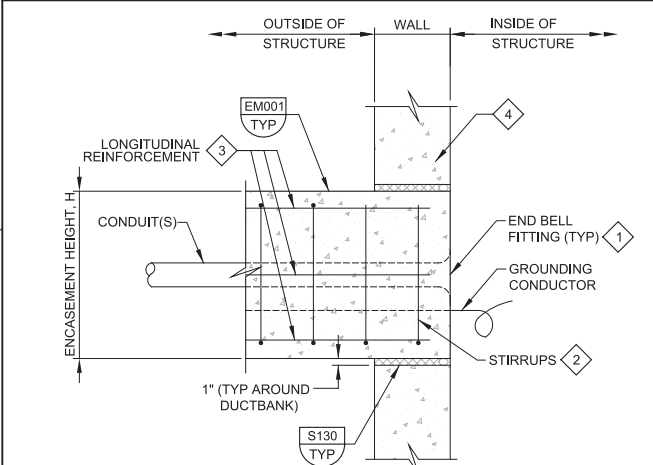
GENERAL NOTES:
1. REFER TO THE SPECIFICATIONS FOR MATERIAL REQUIREMENTS.
KEY NOTES:
1 PROVIDE CONDUIT HOUSE KEEPING CURB AT ALL LOCATIONS WHERE THE CONDUIT IS NOT PROTECTED BY AN EQUIPMENT PAD.

EM032 RISER FROM DUCT BANK
TYP S



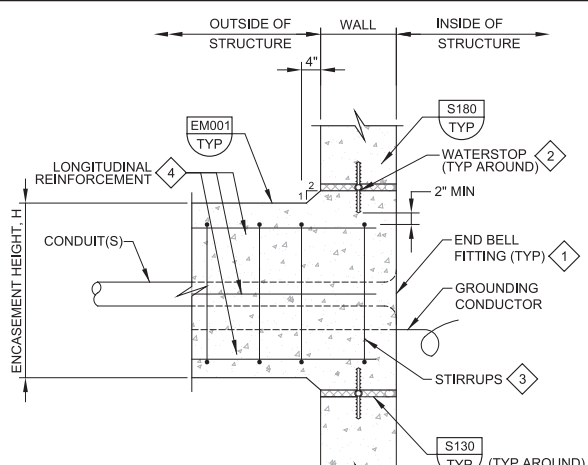
EM058 ELECTRICAL HANDHOLE:
TYP R PRECAST CONCRETE W/ MANHOLE COVER
05/18/21

- NOTES:
- HANDHOLES WITH ONLY FIBER OPTIC CABLE SHALL BE 24" WIDE x 36" LONG x 48" DEEP. ALL OTHER HANDHOLES SHALL BE 48" WIDE x 48" LONG x 48" DEEP.
 - BOND ALL METALLIC ITEMS INSIDE HANDHOLE TO GROUND ROD USING #4 AWG BARE COPPER CABLE.
 - SEE DRAWINGS FOR ORIENTATION, NUMBER, AND SIZE OF DUCT BANKS AT EACH HANDHOLE.
 - HANDHOLE SHALL BE H20 RATED.
- KEY NOTES:
- PROVIDE 36"Ø EMBEDDED TOP FLANGE FRAME AND MANHOLE COVER. PROVIDE TRAFFIC RATED GALVANIZED STEEL COVER FOR FIBER OPTIC HANDHOLES. COVER SHALL BE BOLT DOWN LOCKING AND READ "CITY OF TURLOCK FIBER OPTIC".
 - BOND DUCT BANK AND INTERIOR GROUND CABLE TO GROUND ROD LOCATED OUTSIDE OF DUCT BANK. REFER TO THE SPECIFICATIONS FOR CONNECTION REQUIREMENTS. NOT REQUIRED FOR FIBER OPTIC CONDUIT.
 - INSTALL DUCT BANKS ONLY THROUGH CAST-IN OPENINGS OR PREFORMED KNOCKOUT PANELS. PROVIDE KNOCKOUTS ON EACH WALL AROUND HANDHOLE.
 - PROVIDE MINIMUM 4 INCH DIAMETER, GRAVEL FILLED PENETRATION THROUGH FLOOR OF HANDHOLE. SET SUMP OPENING OVER MINIMUM 18" SQUARE FILTER FABRIC TO ISOLATE GRAVEL FROM BASE MATERIAL BELOW. SECURE BOTTOM OF OPENING WITH CHICKEN WIRE OR EQUAL TO PREVENT RODENT INTRUSION.
 - COAT EXTERIOR WALLS BELOW GRADE WITH BITUMINOUS DAMP PROOFING.
 - MAXIMUM TOP SLAB OVERHANG IS TYPICAL AROUND 4 SIDES OF HANDHOLE.
 - GROUNDING CABLE CONNECTION. REFER TO THE SPECIFICATIONS FOR CONNECTION REQUIREMENTS. NOT REQUIRED FOR FIBER OPTIC CONDUIT.
 - PROVIDE ONE PULLING IRON ON EACH WALL OF HANDHOLE.
 - BASE MATERIAL: PROVIDE MIN 12" COMPACTED AGGREGATE BASE COURSE. COMPACT TO 95% RELATIVE COMPACTION.
 - FOR FIBER OPTIC CONDUIT, USE DETAIL EM015/TYP.



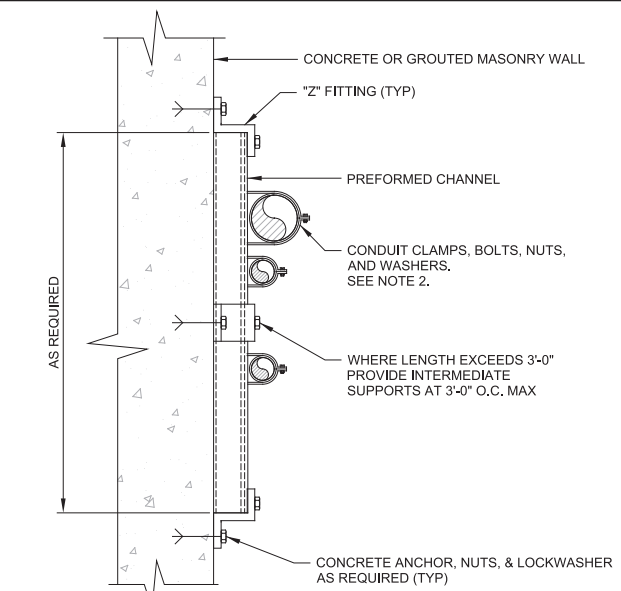
KEY NOTES:
1 PROVIDE GROUNDING FITTING FOR METALLIC CONDUITS ENTERING MANHOLE. BOND GROUNDING FITTING TO DUCTBANK GROUNDING CONDUCTOR.
2 FOR FIRST 12'-0" FROM INSIDE FACE OF STRUCTURE, STIRRUP SPACING IN INCHES = (H-4)/2 WHERE H = CONCRETE ENCASEMENT HEIGHT IN INCHES.
3 ADDITIONAL #4 x 12'-0" @ 12" ON ALL FOUR FACES OF ENCASEMENT. ALTERNATE WITH TYPICAL REINFORCEMENT FOR 6" SPACING.
4 PROVIDE ADDITIONAL REINFORCEMENT AROUND OPENING AS REQUIRED. FOR CAST-IN-PLACE STRUCTURES, PROVIDE REINFORCEMENT PER S180 TYP

EM070 ENCASED CONDUITS AT MANHOLES OR
TYP S STRUCTURES - W/O WATERSTOP



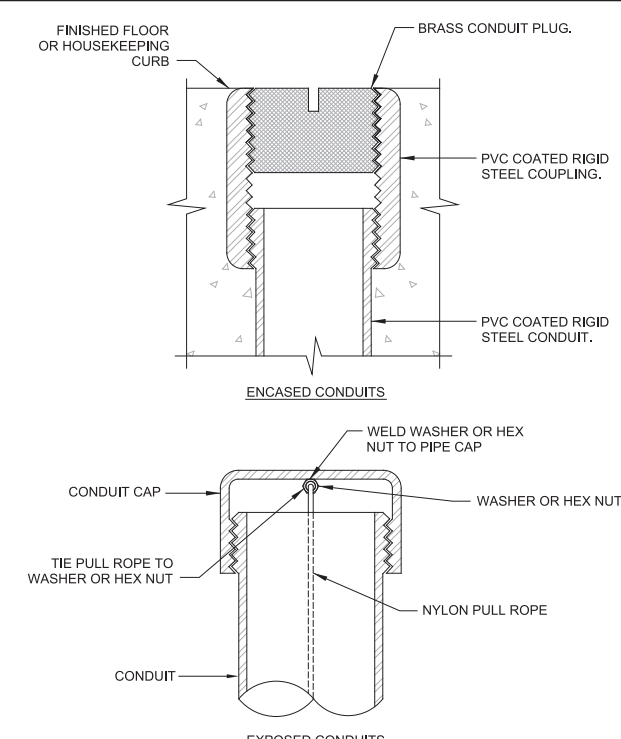
KEY NOTES:
1 PROVIDE GROUNDING FITTING FOR METALLIC CONDUITS ENTERING MANHOLE. BOND GROUNDING FITTING TO DUCTBANK GROUNDING CONDUCTOR.
2 6" PVC CENTERBULB WATERSTOP TYPICAL AROUND PERIMETER OF ENCASEMENT.
3 FOR FIRST 12'-0" FROM INSIDE FACE OF STRUCTURE, STIRRUP SPACING, IN INCHES = (H-4)/2, WHERE H = CONCRETE ENCASEMENT HEIGHT IN INCHES.
4 ADDITIONAL #4 x 12'-0" @ 12" ON ALL FOUR FACES OF ENCASEMENT. ALTERNATE WITH TYPICAL REINFORCEMENT FOR 6" SPACING.

EM071 ENCASED CONDUITS AT MANHOLES OR
TYP S STRUCTURES - WITH WATERSTOP



NOTES:
1. THIS DETAIL TYPICAL FOR BOTH VERTICAL AND HORIZONTAL MOUNTING.
2. MATERIAL FOR PREFORMED CHANNEL, FITTINGS, AND CLAMPS SHALL BE AS SPECIFIED IN SECTION 16070.
3. SUPPORTS TO BE SPACED IN ACCORDANCE WITH NEC REQUIREMENTS FOR THE SMALLEST CONDUIT ATTACHED.

EM101 CONDUIT SUPPORT
TYP S



NOTES:
1. PROVIDE 2" MIN CLEAR BETWEEN ADJACENT CONDUITS

EM105 SPARE CONDUIT DETAIL
TYP S

REV	DATE	BY	DESCRIPTION
1	7/9/21	KLP	CHANGED PER ADDENDUM NO. 3

DESIGNED CE
DRAWN CE
CHECKED TH
DATE JUNE 2021



Kevin Pezzon
Duly signed by Kevin Pezzon
On 06/21/21
Engineer@pezzon.com
City of Turlock Engineering
16269 Kevin Pezzon
Professional Seal reviewed by
4/20/2021 Date: 2021-07-09
12:16:57 PM



CITY OF TURLOCK PROJECT NO. 18-69
SURFACE WATER DISTRIBUTION SYSTEM
IMPROVEMENTS PROJECT
TYPICALS
TYPICAL DETAILS
ELECTRICAL 5

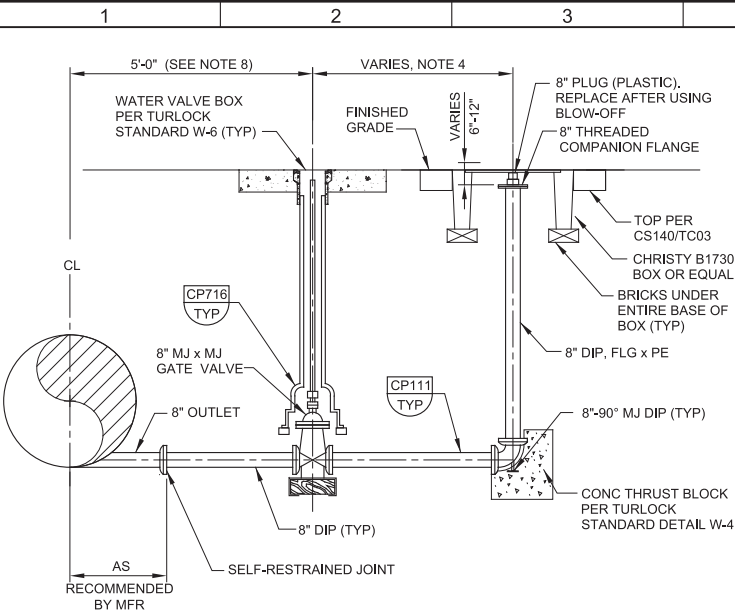
VERIFY SCALES BAR IS ONE INCH ON ORIGINAL DRAWING 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	JOB NO. 11380B.10 DRAWING NO. 00TE05 SHEET NO. 35 OF 213
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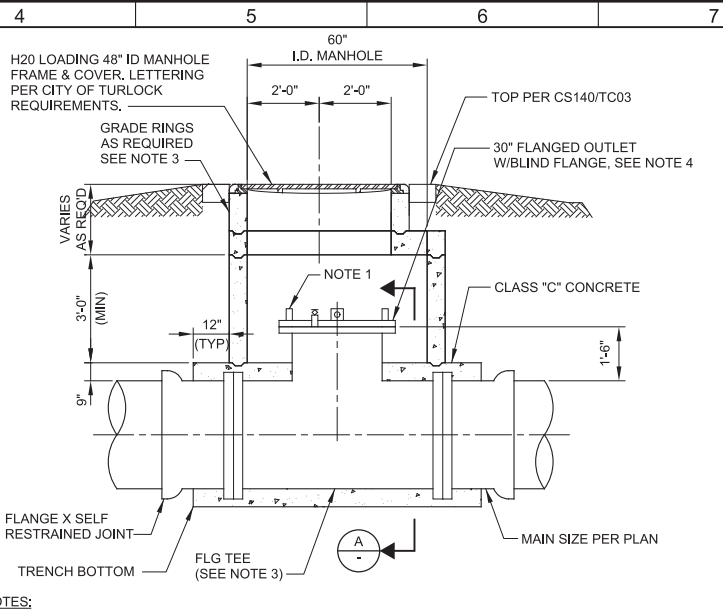
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- NOTES:
1. THE ENTIRE BLOW OFF ASSEMBLY SHALL BE RESTRAINED.
 2. SEE CATHODIC PROTECTION DRAWINGS FOR CATHODIC PROTECTION REQUIREMENTS.
 3. ENCASE ALL DUCTILE IRON PIPE IN POLYETHYLENE PER THE SPECIFICATIONS.
 4. CONTRACTOR TO PROPOSE LOCATION OF BLOW-OFF TO ENGINEER AND OBTAIN APPROVAL PRIOR TO INSTALLATION. LOCATION MUST BE EASILY ACCESSIBLE BY CITY STAFF AND WITHIN RIGHT-OF-WAY. PRELIMINARY LOCATION SHOWN ON DRAWINGS.
 5. ALL AT GRADE UTILITY BOXES SHALL BE HS-20 RATED.
 6. WHERE BLOW OFF ASSEMBLY IS SHOWN ADJACENT TO EDGE OF RIGHT-OF-WAY OR PROPERTY LINE, INSTALL AS CLOSE AS POSSIBLE TO THE RIGHT-OF-WAY OR PROPERTY LINE.
 7. LID SHALL BE GALVANIZED, SKID RESISTANT, BOLT DOWN LOCKING, AND MARKED WITH "CITY OF TURLOCK" AND "WATER".
 8. FIELD CONFIRM DISTANCE WITH ENGINEER.

P805 8" BLOW-OFF ASSEMBLY
TYP R

03/25/21

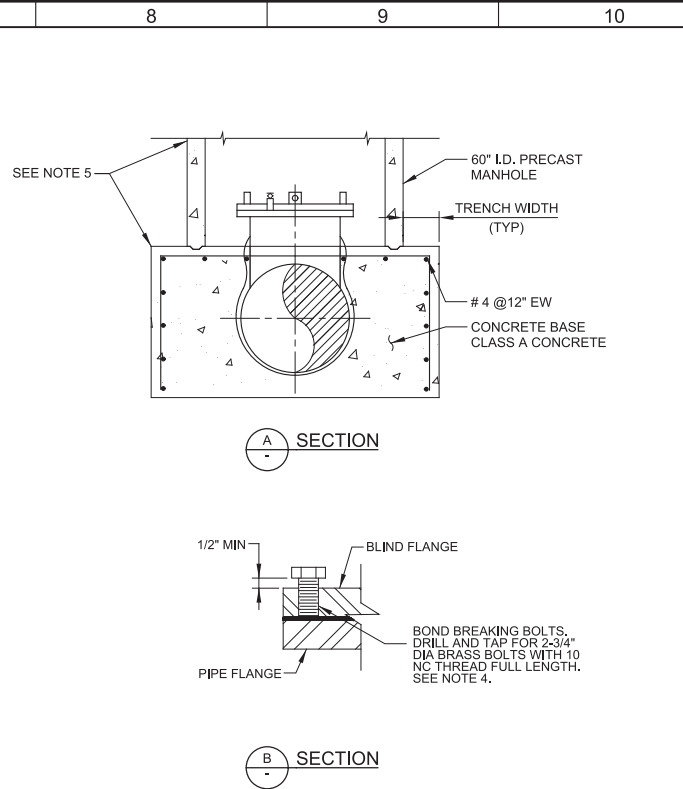


- NOTES:
1. PROVIDE FOUR LIFTING LUGS AT 90° SEPARATION, DRILL AND TAP FLANGE WITH 1" CORP STOP AND CAP.
 2. PROVIDE REDUCING TEE WHERE MAIN SIZE IS GREATER THAN 30". FOR MAINS SMALLER THAN 30", FLANGE TEE BRANCH SHALL MATCH MAIN SIZE.
 3. IF NO GRADE RINGS ARE REQUIRED, FABRICATE THE 60" TO 48" REDUCING RING WITHOUT THE VERTICAL LIP.
 4. INSTALL BOND BREAKING BOLTS PER DETAIL B MIDWAY BETWEEN STANDARD BOLT PATTERN AND 180 DEGREES APART.
 5. PROVIDE RAIN-NEK JOINT SEALANT AT INTERFACE OF PRECAST MANHOLE SECTION AND TOP OF CONCRETE AND ALL GRADE RINGS. GROUT ALL JOINTS AFTER INSTALLATION. COAT EXTERIOR OF MANHOLE WITH SURFACE SEALANT SYSTEM PER THE SPECIFICATIONS. COAT FROM OUTER EDGE OF CONCRETE BASE TO SURFACE.
 6. DURING INITIAL PIPE FILLING AND IMMEDIATELY PRIOR TO FINAL COMPLETION CONTRACTOR SHALL VENT AIR FROM A CORP STOP.
 7. IN LIEU OF A FLANGED TEE, CONTRACTOR MAY PROPOSE WELDING A 30" OUTLET ONTO THE PIPE BARREL AND NO JOINTS SHALL BE WITHIN 6" OF CONCRETE ENCASEMENT BENEATH MANHOLE.

P806 ACCESS TEE ASSEMBLY
TYP R

SHEET 1 OF 2

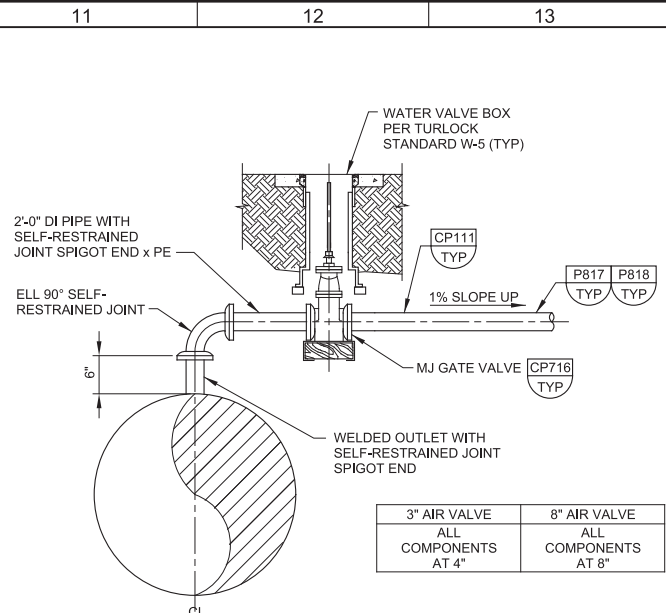
03/25/21



P810 ACCESS TEE ASSEMBLY
TYP J

SHEET 2 OF 2

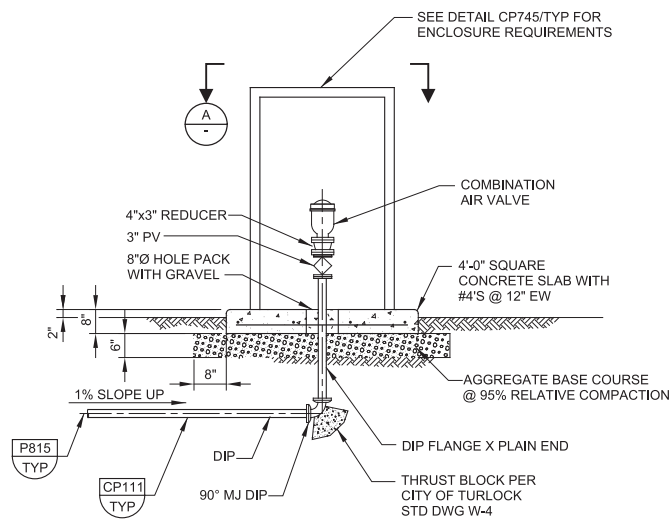
08/28/17



- NOTES:
1. SEE CATHODIC PROTECTION DRAWINGS FOR CATHODIC PROTECTION REQUIREMENTS.
 2. ENCASE ALL DUCTILE IRON PIPE IN POLYETHYLENE PER THE SPECIFICATIONS.
 3. THE ENTIRE AIR VALVE ASSEMBLY SHALL BE RESTRAINED.
 4. ALL AT GRADE UTILITY BOXES SHALL BE HS-20 RATED.
 5. CONCRETE TOP BLOCKS SHALL BE IN ACCORDANCE WITH CITY OF TURLOCK STANDARDS.

P815 AIR VALVE ASSEMBLY CONNECTION
TYP R

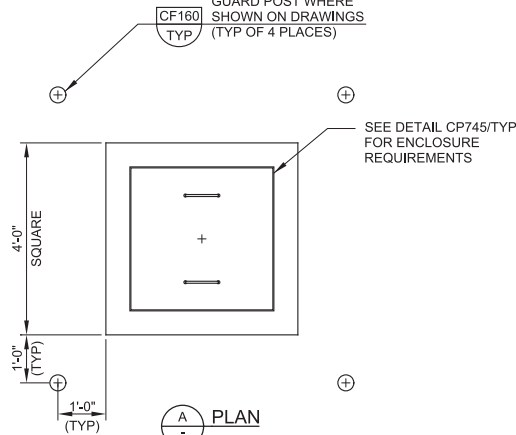
04/19/21



P817 ABOVE GROUND AIR VALVE ASSEMBLY
TYP J

SHEET 1 OF 2

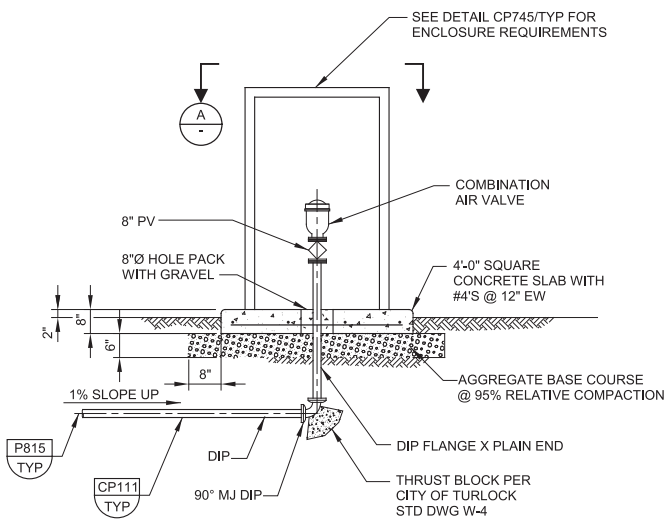
04/19/21



P817 ABOVE GROUND AIR VALVE ASSEMBLY
TYP J

SHEET 2 OF 2

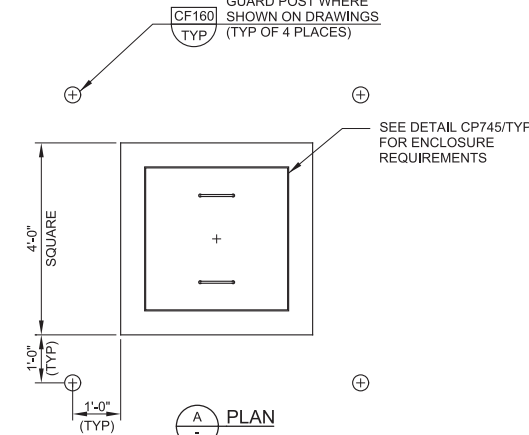
08/28/17



P818 ABOVE GROUND AIR VALVE ASSEMBLY
TYP J

SHEET 1 OF 2

04/19/21



P818 ABOVE GROUND AIR VALVE ASSEMBLY
TYP J

SHEET 2 OF 2

08/28/17

DESIGNED
CE
DRAWN
CE
CHECKED
MD
DATE
JUNE 2021



Digitally signed by Jonathan P. Marshall
Contact info: Carollo Engineering, Inc.
Date: 2020.07.09 11:02:30 -0700



STANISLAUS COUNTY, CALIFORNIA

CITY OF TURLOCK PROJECT NO. 18-69
SURFACE WATER DISTRIBUTION SYSTEM
IMPROVEMENTS PROJECT

TYPICALS
TYPICAL DETAILS
PIPING 4

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO.

11380B.10

DRAWING NO.

00TP04

SHEET NO.

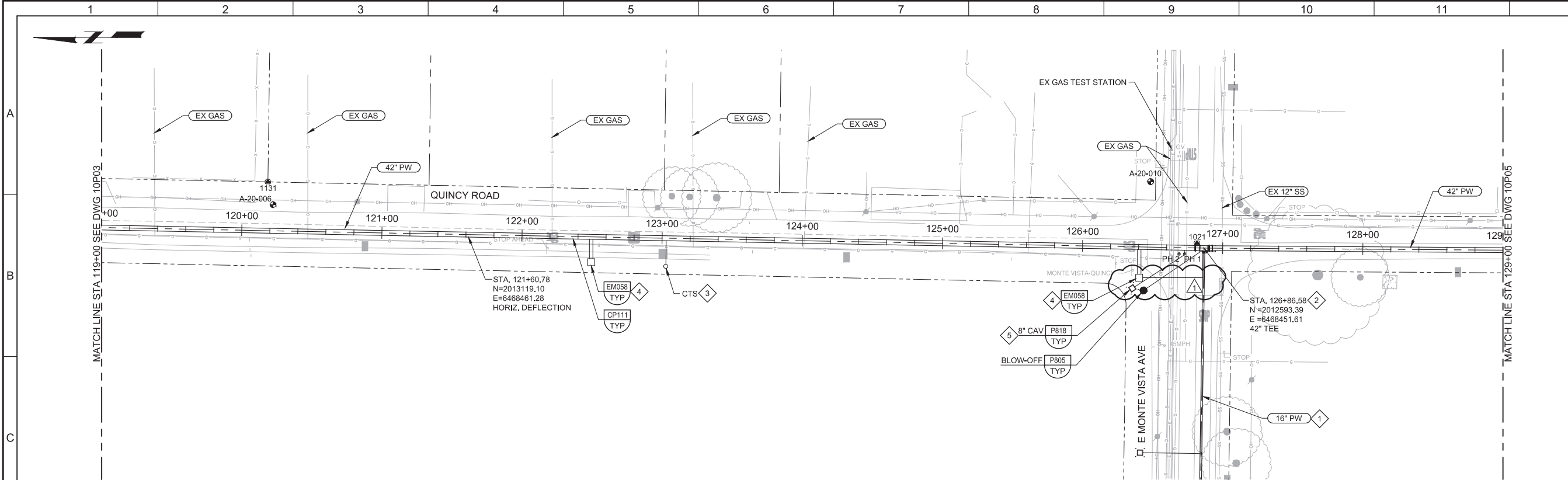
47 OF 213

Plot Date: 7/8/2021 12:20:05 PM

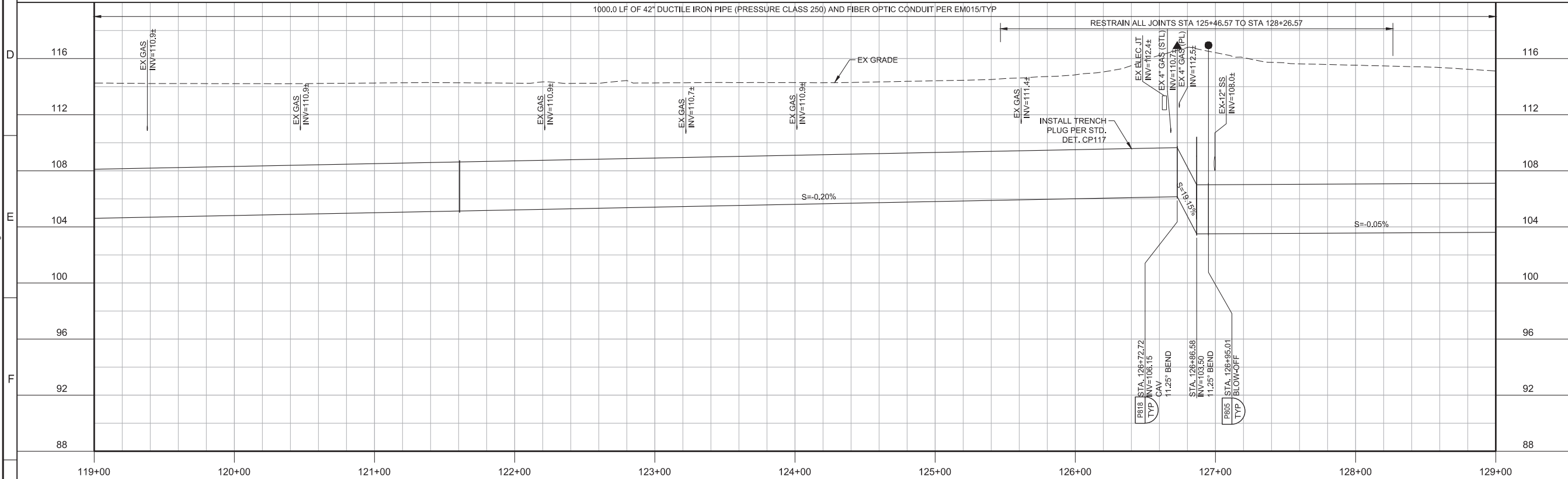
FILE NAME: 11380B1010P04.dwg

PROJECT NO. 11380B10

LAST SAVED BY: JDonato



PLAN
FILE: 11380B1000C101



PROFILE
FILE: 11380B1000C101

GENERAL NOTES:

- CONTRACTOR SHALL TAKE SPECIAL PRECAUTIONS IN THE VICINITY OF ALL OVERHEAD UTILITY LINES, SUCH AS ELECTRICAL AND COMMUNICATION. CONTRACTOR SHALL ABIDE BY THE REQUIREMENTS OF THE NATIONAL ELECTRIC CODE, CAL-OSHA, AND OVERHEAD UTILITY OWNER. CONTRACTOR RESPONSIBLE FOR COORDINATING WITH OVERHEAD UTILITY OWNER AND COSTS TO SUPPORT POLES WHEN WORKING ADJACENT TO POLES.
- CONTRACTOR SHALL RESTORE MONUMENTS ALTERED OR DAMAGED DURING CONSTRUCTION PER SPECIFICATION SECTION 01722.

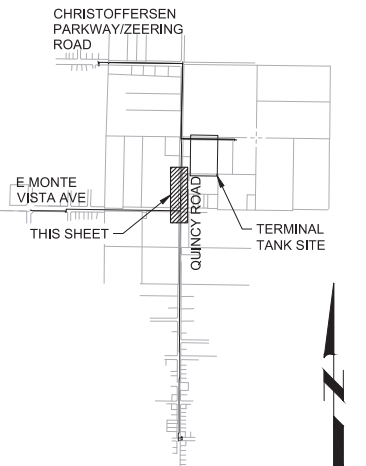
KEY NOTES:

- FOR 16" POTABLE WATER PLAN AND PROFILES, SEE DRAWINGS 10P12-10P14.
- CONNECTION PER DTL 03, DWG 10P18.
- SEE CATHODIC PROTECTION DRAWINGS.
- CONSTRUCT FIBER OPTIC VAULT WITH A MINIMUM 3-FOOT HORIZONTAL SEPARATION FROM THE OUTSIDE OF PIPELINE TO OUTSIDE VAULT.
- PIPELINE MAY NEED TO BE INSTALLED AT SHALLOW DEPTH TO MAINTAIN SLOPE AND AVOID EXISTING UTILITIES. CONTRACTOR SHALL CONFIRM ARV VENT PIPE DEPTH THROUGH POT-HOLING PER SECTION 02280. WHERE DEPTH TO TOP OF PIPE IS SHALLOWER THAN 30 INCHES, ENCASE IN CONCRETE PER CP119/TYP. FOR BIDDING PURPOSES, ANTICIPATE VENT PIPE WILL NEED TO BE ENCASED.

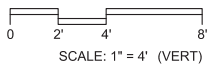
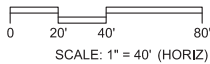


Know what's below.
Call before you dig.

KEY MAP



SCALE



REV	DATE	BY	DESCRIPTION
1	7/9/21	JPM	CHANGED PER ADDENDUM NO. 3

DESIGNED AAC
DRAWN JRD
CHECKED MD/DGB
DATE JUNE 2021



Digitally signed by Jonathan P. Marshall
Contact Info: Carollo Engineering, Inc.
Date: 2021.07.09 10:52:27 -0700




STANISLAUS COUNTY, CALIFORNIA

CITY OF TURLOCK PROJECT NO. 18-69
SURFACE WATER DISTRIBUTION SYSTEM
IMPROVEMENTS PROJECT
CIVIL
PLAN AND PROFILE - ALIGNMENT B - QUINCY ROAD
STA 119+00 TO STA 129+00

VERIFY SCALES BAR IS ONE INCH ON ORIGINAL DRAWING 0 1"	JOB NO. 11380B.10 DRAWING NO. 10P04 SHEET NO. 59 OF 213
--	--



VERIFY SCALES BAR IS ONE INCH ON ORIGINAL DRAWING 0  1"	JOB NO. 11380B.10
	DRAWING NO. 10P08
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	SHEET NO. 63 OF 213

1. CONNECTION PER DTL 04, DWG 10P18.
2. CONSTRUCTION FIBER OPTIC VAULT WITH A MINIMUM 3-FEET HORIZONTAL SEPARATION FROM THE OUTSIDE OF PIPELINE TO OUTSIDE VAULT.
3. SEE CATHODIC PROTECTION DRAWINGS, FLUSH MOUNTED TYPE.
4. FROM STA 153+20 TO 166+86 EXCAVATE PIPE TRENCH TO MINIMUM WIDTH PER SECTION 02318 WITH CLSM PLACED IN PIPE EMBEDMENT ZONE CP113/TYP.
5. LOCATE STA 164+35.54 TO STA 166+86.50 MIDWAY BETWEEN WATER AND SEWER BASED ON REQUIRED POTHOLING PER SECTION 02280.
6. PIPELINE MAY NEED TO BE INSTALLED AT SHALLOW DEPTH TO MAINTAIN SLOPE AND AVOID EXISTING UTILITIES, CONTRACTOR SHALL CONFIRM ARV VENT PIPE DEPTH THROUGH POTHOLES PER SECTION 02280, WHERE DEPTH TO TOP OF PIPE IS SHALLOWER THAN 30 INCHES, ENCASE IN CONCRETE PER CP119/TYP, FOR BIDDING PURPOSES, ANTICIPATE VENT PIPE WILL NEED TO BE ENCASED.



KEY MAP

SCALE: 1" = 4' (VERT)

BAR IS ONE INCH ON

ORIGINAL DRAWING

IF NOT ONE INCH ON

THIS SHEET, ADJUST
SHEETS, ADJUST

SCALES ACCORDINGLY

JOB NO.

11380B.10

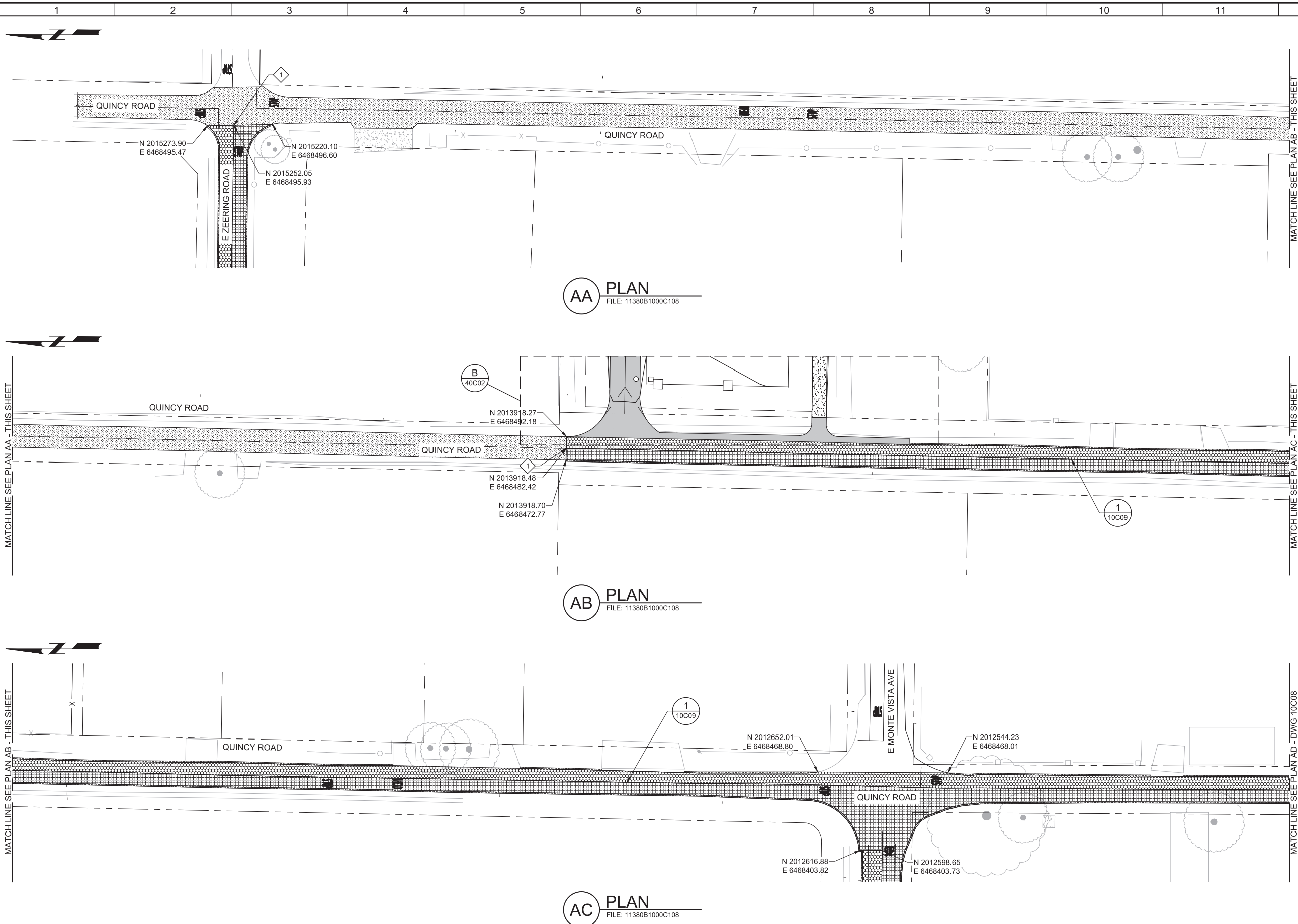
DRAWING M

10P08

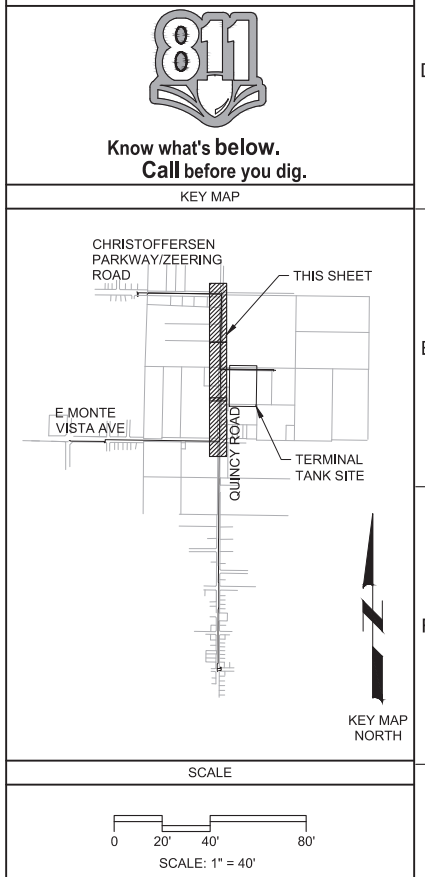
SHEET NO.

63 OF 2

Plot Date: 7/8/2021 12:39:10 PM
FILE NAME: 11380B1010C07.dwg
PROJECT NO. 11380B10
LAST SAVED BY: JDonato



- GENERAL NOTES:**
- PER SECTION 01722, PRIOR TO COMMENCING CONSTRUCTION, RECORD ALL SURVEY MONUMENTS BY A LAND SURVEYOR AND RESTORE ALL DISTURBED SURVEY MONUMENTS AFTER ROADWAY RESTORATION TO CURRENT STANDARDS.
 - PER SECTION 02762, PRIOR TO COMMENCING CONSTRUCTION, RECORD ALL PAVEMENT STRIPING LOCATIONS AND TYPES. DEVELOP A PAVEMENT STRIPING MATERIAL STANDARDS FOR APPROVAL, AND INSTALL NEW MARKERS AFTER PAVING. INSTALL TEMPORARY PAVEMENT MARKERS, AS REQUIRED, PRIOR TO PERMANENT PAVEMENT MARKER INSTALLATION.
 - WHERE CONSTRUCTION DAMAGES CONCRETE (SUCH AS CURB, GUTTER OR SIDEWALKS), REPLACE THE DAMAGE IN ACCORDANCE WITH THE STANDARDS OF THE AUTHORITY HAVING JURISDICTION.
- KEY NOTES:**
- CONTRACTOR SHALL COORDINATE PERMANENT PAVING TRANSITION WITH SRWA.
- LEGEND:**
- 4" ASPHALT CONCRETE OVER 6" AGGREGATE BASE 95% RELATIVE COMPACTION
 - 2" GRIND AND OVERLAY PER STANISLAUS COUNTY STANDARDS
 - COMPACTED NATIVE ROAD AT 95% RELATIVE COMPACTION
 - PERMANENT PAVING PERFORMED BY SRWA. INSTALL TEMPORARY PAVING PER CITY STANDARD DETAIL T-1
 - 2" GRIND AND OVERLAY PER CITY STANDARD DETAIL T-1 TO T-5
 - REPLACE STAMPED ASPHALT PER DETAIL 1, DWG 10C10
 - FULL RECONSTRUCTION PER DETAIL 1, DWG 10C09
 - ABC
 - CONCRETE



REV	DATE	BY	DESCRIPTION
1	7/9/21	JPM	CHANGED PER ADDENDUM NO. 3

DESIGNED AAC	
DRAWN JRD	
CHECKED MD/DGB	
DATE JUNE 2021	

Digitally signed by Jonathan P. Marshall
Contact Info: Carollo Engineers, Inc.
Date: 2021.07.09 10:59:29 -0700



STANISLAUS COUNTY, CALIFORNIA

CITY OF TURLOCK PROJECT NO. 18-69
SURFACE WATER DISTRIBUTION SYSTEM
IMPROVEMENTS PROJECT
CIVIL
PAVING AND GRADING - ALIGNMENT B
QUINCY ROAD 1

VERIFY SCALES BAR IS ONE INCH ON ORIGINAL DRAWING 0 1" 80 IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	JOB NO. 11380B.10 DRAWING NO. 10C07 SHEET NO. 80 OF 213
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Plot Date: 7/8/2021 12:51:59 PM

FILE NAME: 11380B10C08.dwg

PROJECT NO. 11380B10

LAST SAVED BY: JDonato

MATCH LINE SEE PLAN AC - DWG 10C07

MATCH LINE SEE PLAN AD - THIS SHEET

MATCH LINE SEE PLAN AE - THIS SHEET

MATCH LINE SEE PLAN AE - THIS SHEET

MATCH LINE SEE PLAN AF - THIS SHEET

MATCH LINE SEE PLAN AG - DWG 10C09



AD PLAN
FILE: 11380B1000C108

AE PLAN
FILE: 11380B1000C108

AF PLAN
FILE: 11380B1000C108

GENERAL NOTES:

- PER SECTION 01722, PRIOR TO COMMENCING CONSTRUCTION, RECORD ALL SURVEY MONUMENTS BY A LAND SURVEYOR AND RESTORE ALL DISTURBED SURVEY MONUMENTS AFTER ROADWAY RESTORATION TO CURRENT STANDARDS.
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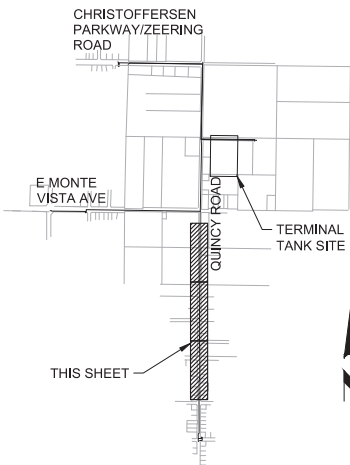
LEGEND:

- 4" ASPHALT CONCRETE OVER 6" AGGREGATE BASE 95% RELATIVE COMPACTION
- 2" GRIND AND OVERLAY PER STANISLAUS COUNTY STANDARDS
- COMPACTED NATIVE ROAD AT 95% RELATIVE COMPACTION
- PERMANENT PAVING PERFORMED BY SRWA. INSTALL TEMPORARY PAVING PER CITY STANDARD DETAIL T-1
- 2" GRIND AND OVERLAY PER CITY STANDARD DETAIL T-1 TO T-5
- REPLACE STAMPED ASPHALT PER DETAIL 1, DWG 10C10
- FULL RECONSTRUCTION PER DETAIL 1, DWG 10C09
- ABC
- CONCRETE



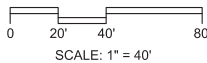
Know what's below.
Call before you dig.

KEY MAP



KEY MAP NORTH

SCALE



REV	DATE	BY	DESCRIPTION
1	7/9/21	JPM	CHANGED PER ADDENDUM NO. 3

DESIGNED
AAC
DRAWN
JRD
CHECKED
MD/DGB
DATE
JUNE 2021



Digitally signed by Jonathan P. Marshall
Contact info: Carollo Engineers, Inc.
Date: 2021.07.09 11:01:12 -0700



STANISLAUS COUNTY, CALIFORNIA

CITY OF TURLOCK PROJECT NO. 18-69
SURFACE WATER DISTRIBUTION SYSTEM
IMPROVEMENTS PROJECT

CIVIL
PAVING AND GRADING - ALIGNMENT B
QUINCY ROAD 2

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO.
11380B.10

DRAWING NO.
10C08

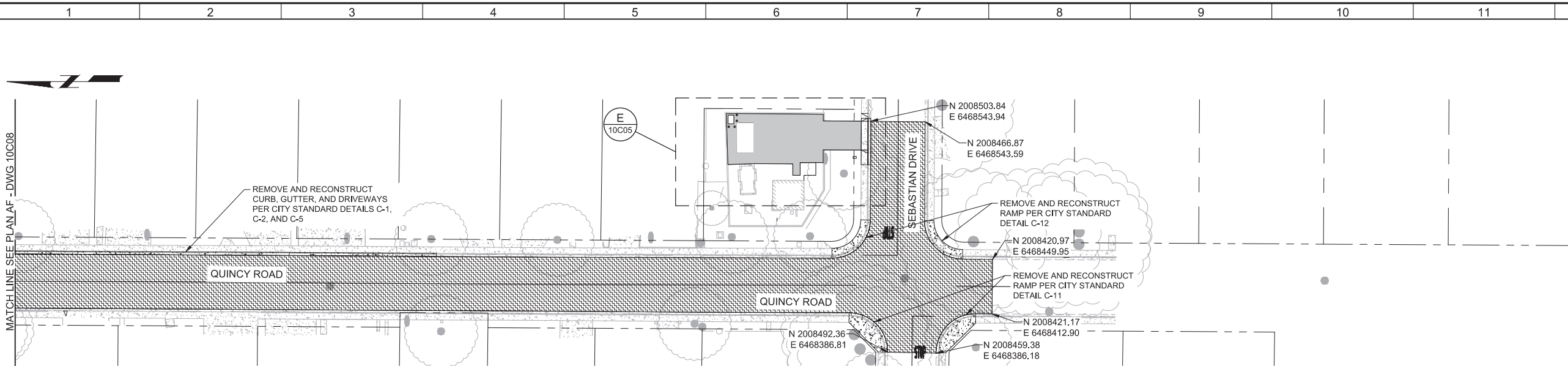
SHEET NO.
81 OF 213

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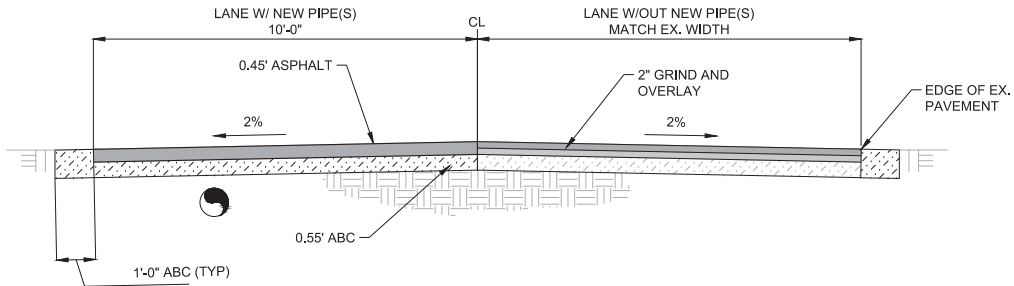
FILE NAME: 11380B1010C09.dwg

PROJECT NO. 11380B10

LAST SAVED BY: JDonato



AG PLAN
FILE: 11380B1000C108



NOTES:

1. PAVEMENT CROSS SLOPE SHALL BE 2.0% MINIMUM TO EXTENT POSSIBLE.

1 STANISLAUS COUNTY ROAD SECTION
SCALE: NOT TO SCALE
FILE: 11380B1010C09

GENERAL NOTES:

1. PER SECTION 01722, PRIOR TO COMMENCING CONSTRUCTION, RECORD ALL SURVEY MONUMENTS BY A LAND SURVEYOR AND RESTORE ALL DISTURBED SURVEY MONUMENTS AFTER ROADWAY RESTORATION TO CURRENT STANDARDS.
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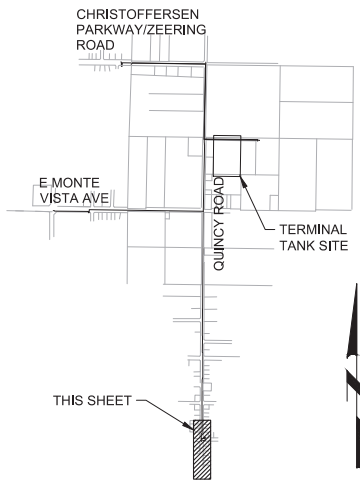
LEGEND:

- 4" ASPHALT CONCRETE OVER 6" AGGREGATE BASE 95% RELATIVE COMPACTION
- 2" GRIND AND OVERLAY PER STANISLAUS COUNTY STANDARDS
- COMPACTED NATIVE ROAD AT 95% RELATIVE COMPACTION
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- REPLACE STAMPED ASPHALT PER DETAIL 1, DWG 10C10
- FULL RECONSTRUCTION PER DETAIL 1, DWG 10C09
- ABC
- CONCRETE

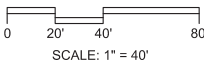


**Know what's below.
Call before you dig.**

KEY MAP



SCALE



REV	DATE	BY	DESCRIPTION
1	7/9/21	JPM	CHANGED PER ADDENDUM NO. 3

DESIGNED AAC
DRAWN JRD
CHECKED MD/DGB
DATE JUNE 2021



Digitally signed by Jonathan P. Marshall
Contact info: Carollo Engineers, Inc.
Date: 2021.07.09 10:52:40 -0700



STANISLAUS COUNTY, CALIFORNIA

**CITY OF TURLOCK PROJECT NO. 18-69
SURFACE WATER DISTRIBUTION SYSTEM
IMPROVEMENTS PROJECT**

**PAVING AND GRADING - ALIGNMENT B
QUINCY ROAD 3**

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO.
11380B.10

DRAWING NO.
10C09

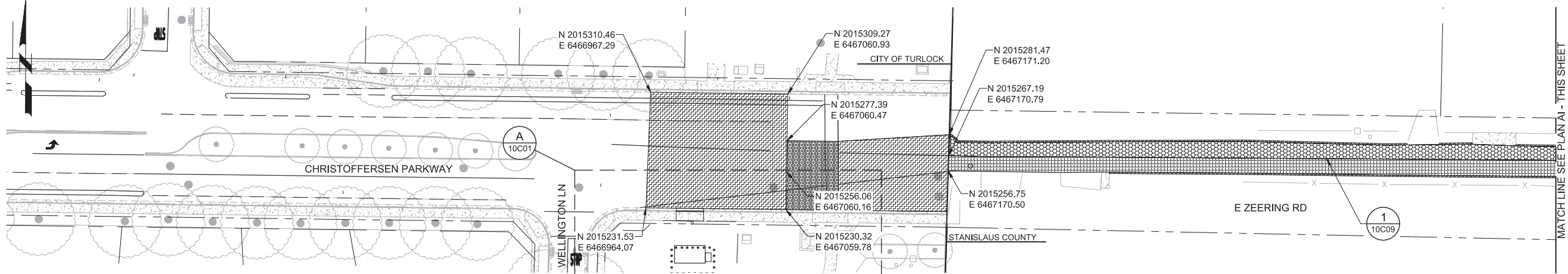
SHEET NO.
82 OF 213

Plot Date: 7/9/2021 10:11:00 AM

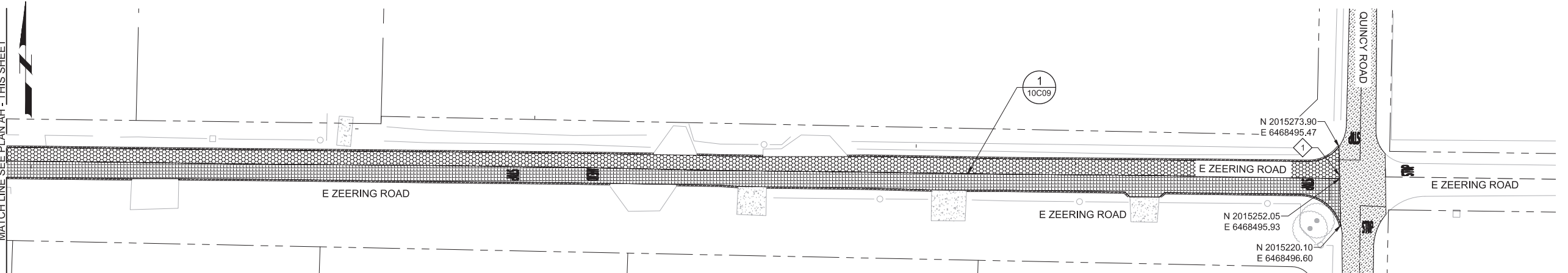
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PROJECT NO. 11380B10

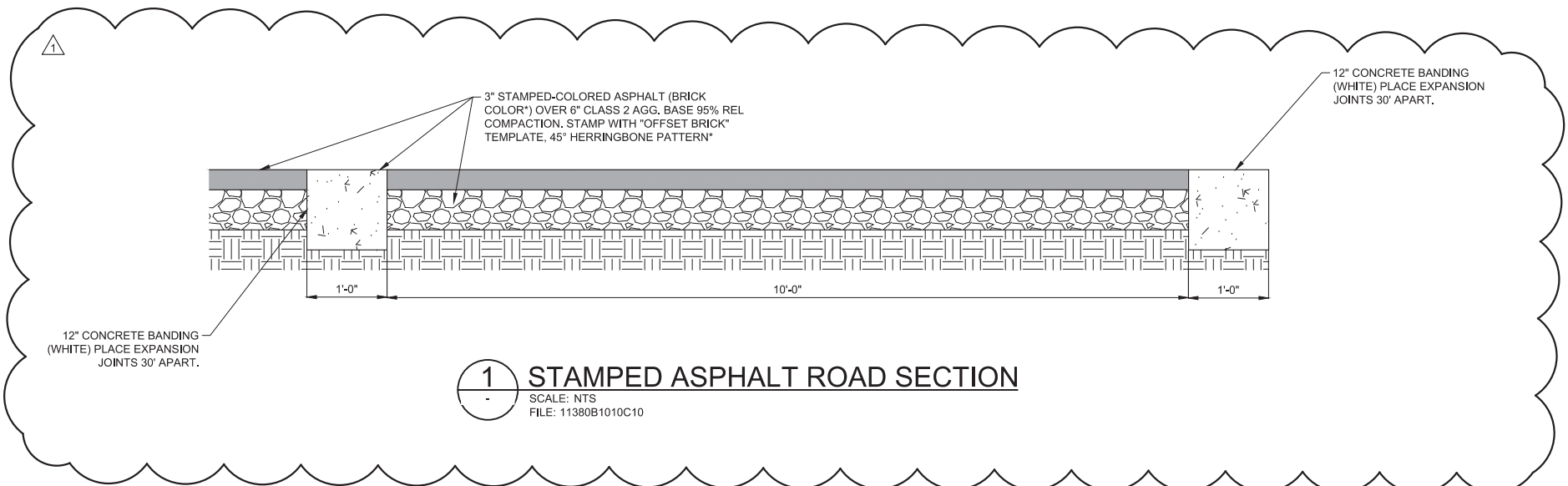
LAST SAVED BY: JDDonato



AH PLAN
FILE: 11380B1000C108



AI PLAN
FILE: 11380B1000C108



GENERAL NOTES:

- PER SECTION 01722, PRIOR TO COMMENCING CONSTRUCTION, RECORD ALL SURVEY MONUMENTS BY A LAND SURVEYOR AND RESTORE ALL DISTURBED SURVEY MONUMENTS AFTER ROADWAY RESTORATION TO CURRENT STANDARDS.
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KEY NOTES:

- CONTRACTOR SHALL COORDINATE PERMANENT PAVING TRANSITION WITH SRWA.

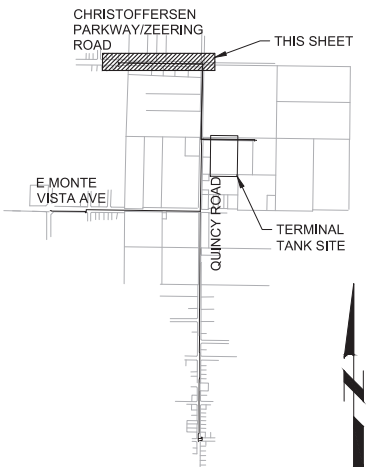
LEGEND:

- 4" ASPHALT CONCRETE OVER 6" AGGREGATE BASE 95% RELATIVE COMPACTION
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- COMPACTED NATIVE ROAD AT 95% RELATIVE COMPACTION
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- REPLACE STAMPED ASPHALT PER DETAIL 1, DWG 10C10
- FULL RECONSTRUCTION PER DETAIL 1, DWG 10C09
- ABC
- CONCRETE



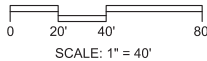
Know what's below.
Call before you dig.

KEY MAP



KEY MAP
NORTH

SCALE



SCALE: 1" = 40'

REV	DATE	BY	DESCRIPTION
1	7/9/21	JPM	CHANGED PER ADDENDUM NO. 3

DESIGNED
AAC
DRAWN
JRD
CHECKED
MD/DGB
DATE
JUNE 2021



Digitally signed by Jonathan P. Marshall
Contact info: Carollo Engineering, Inc.
Date: 2021.07.09 11:01:40 -0700

carollo



STANISLAUS COUNTY, CALIFORNIA

CITY OF TURLOCK PROJECT NO. 18-69
SURFACE WATER DISTRIBUTION SYSTEM
IMPROVEMENTS PROJECT

CIVIL
PAVING AND GRADING - ALIGNMENT C
E ZEERING ROAD

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO.
11380B.10

DRAWING NO.
10C10

SHEET NO.

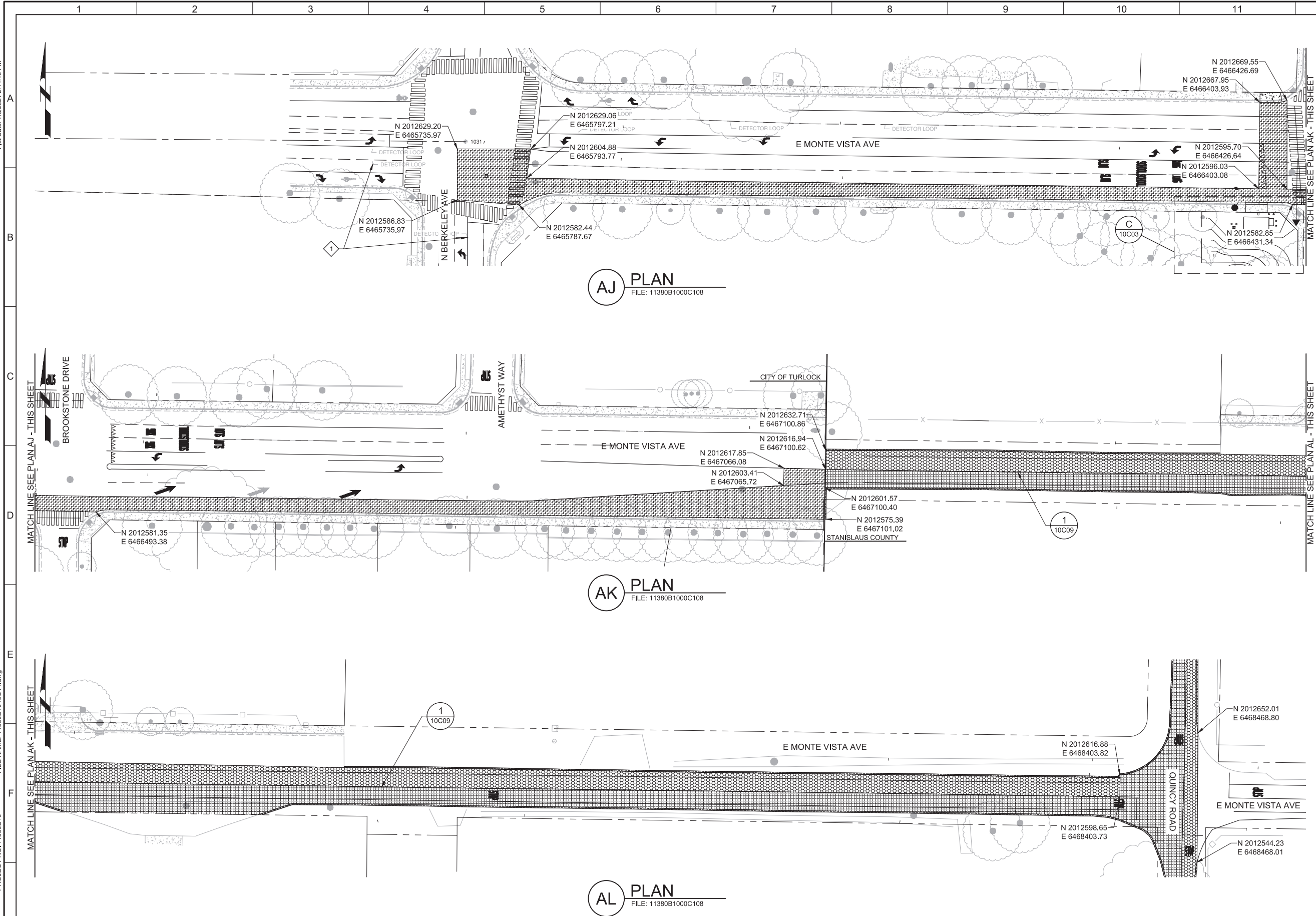
83 OF 213

Plot Date: 7/8/2021 2:14:15 PM

FILE NAME: 11380B1010C1.dwg

PROJECT NO. 11380B10

LAST SAVED BY: JDonato



GENERAL NOTES:

- PER SECTION 01722, PRIOR TO COMMENCING CONSTRUCTION, RECORD ALL SURVEY MONUMENTS BY A LAND SURVEYOR AND RESTORE ALL DISTURBED SURVEY MONUMENTS AFTER ROADWAY RESTORATION TO CURRENT STANDARDS.
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- WHERE CONSTRUCTION DAMAGES CONCRETE (SUCH AS CURB, GUTTER OR SIDEWALKS), REPLACE THE DAMAGE IN ACCORDANCE WITH THE STANDARDS OF THE AUTHORITY HAVING JURISDICTION.

KEY NOTES:

- EX TRAFFIC SIGNAL LOOPS, PROTECT IN PLACE.

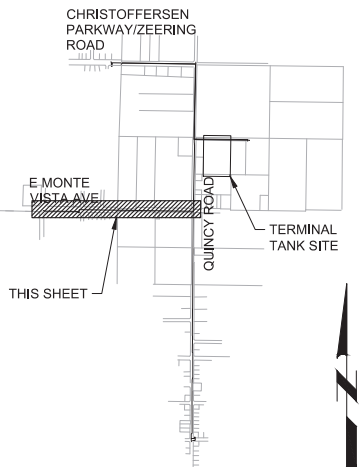
LEGEND:

- 4" ASPHALT CONCRETE OVER 6" AGGREGATE BASE 95% RELATIVE COMPACTION
- 2" GRIND AND OVERLAY PER STANISLAUS COUNTY STANDARDS
- COMPACTED NATIVE ROAD AT 95% RELATIVE COMPACTION
- PERMANENT PAVING PERFORMED BY SRWA. INSTALL TEMPORARY PAVING PER CITY STANDARD DETAIL T-1
- 2" GRIND AND OVERLAY PER CITY STANDARD DETAIL T-1 TO T-5
- REPLACE STAMPED ASPHALT PER DETAIL 1, DWG 10C10
- FULL RECONSTRUCTION PER DETAIL 1, DWG 10C09
- ABC
- CONCRETE



Know what's below.
Call before you dig.

KEY MAP



SCALE

0 20' 40' 80'
SCALE: 1" = 40'

REV	DATE	BY	DESCRIPTION
1	7/9/21	JPM	CHANGED PER ADDENDUM NO. 3

DESIGNED
AAC
DRAWN
JRD
CHECKED
MD/DGB
DATE
JUNE 2021



Digitally signed by Jonathan P. Marshall
Contact Info: Carollo Engineers, Inc.
Date: 2021.07.09 11:00:00 -0700
Jonathan P. Marshall

carollo



STANISLAUS COUNTY, CALIFORNIA

CITY OF TURLOCK PROJECT NO. 18-69
SURFACE WATER DISTRIBUTION SYSTEM
IMPROVEMENTS PROJECT

CIVIL
PAVING AND GRADING - ALIGNMENT D
E MONTE VISTA AVE

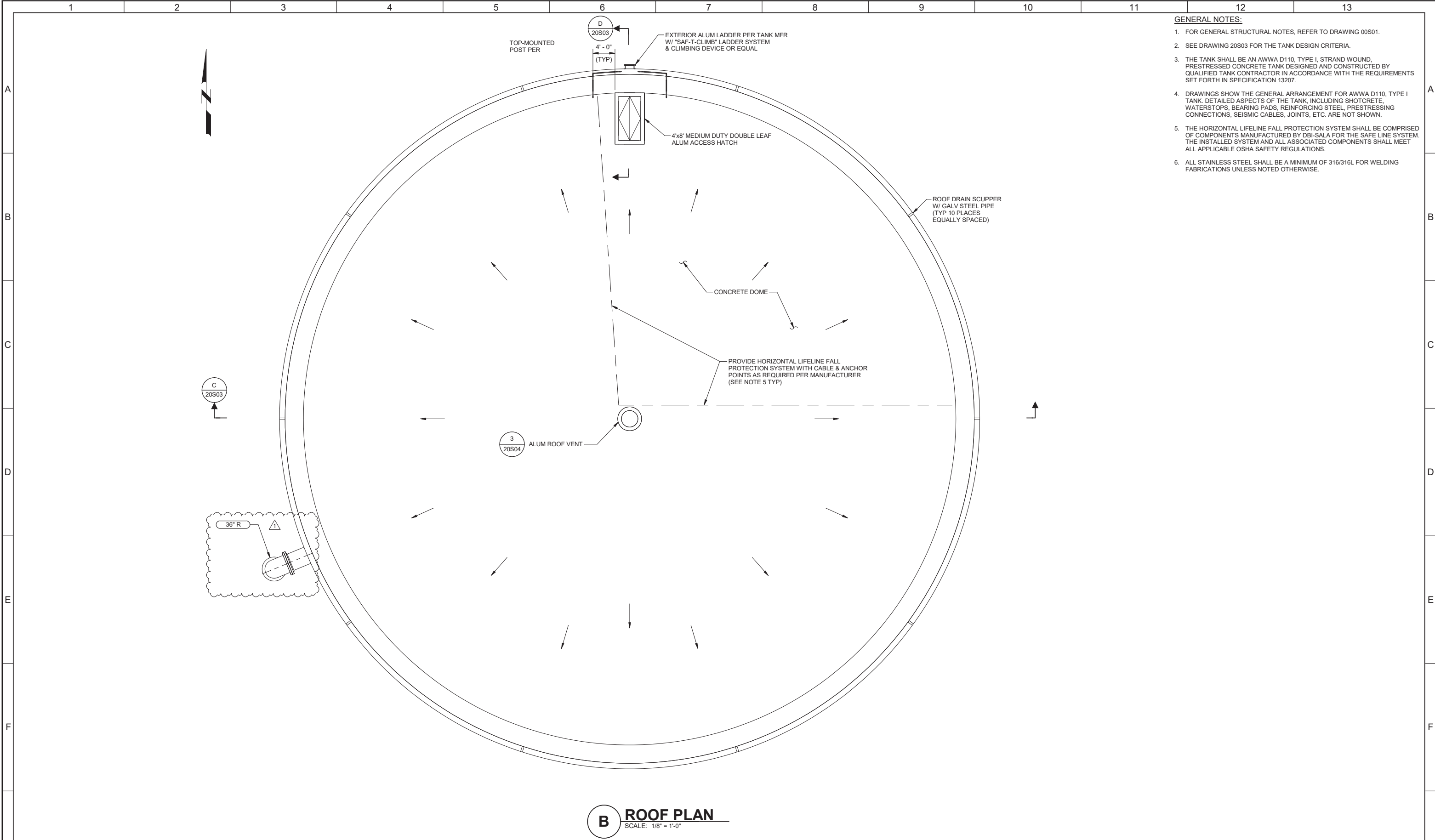
VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO.
11380B.10

DRAWING NO.
10C11

SHEET NO.
84 OF 213

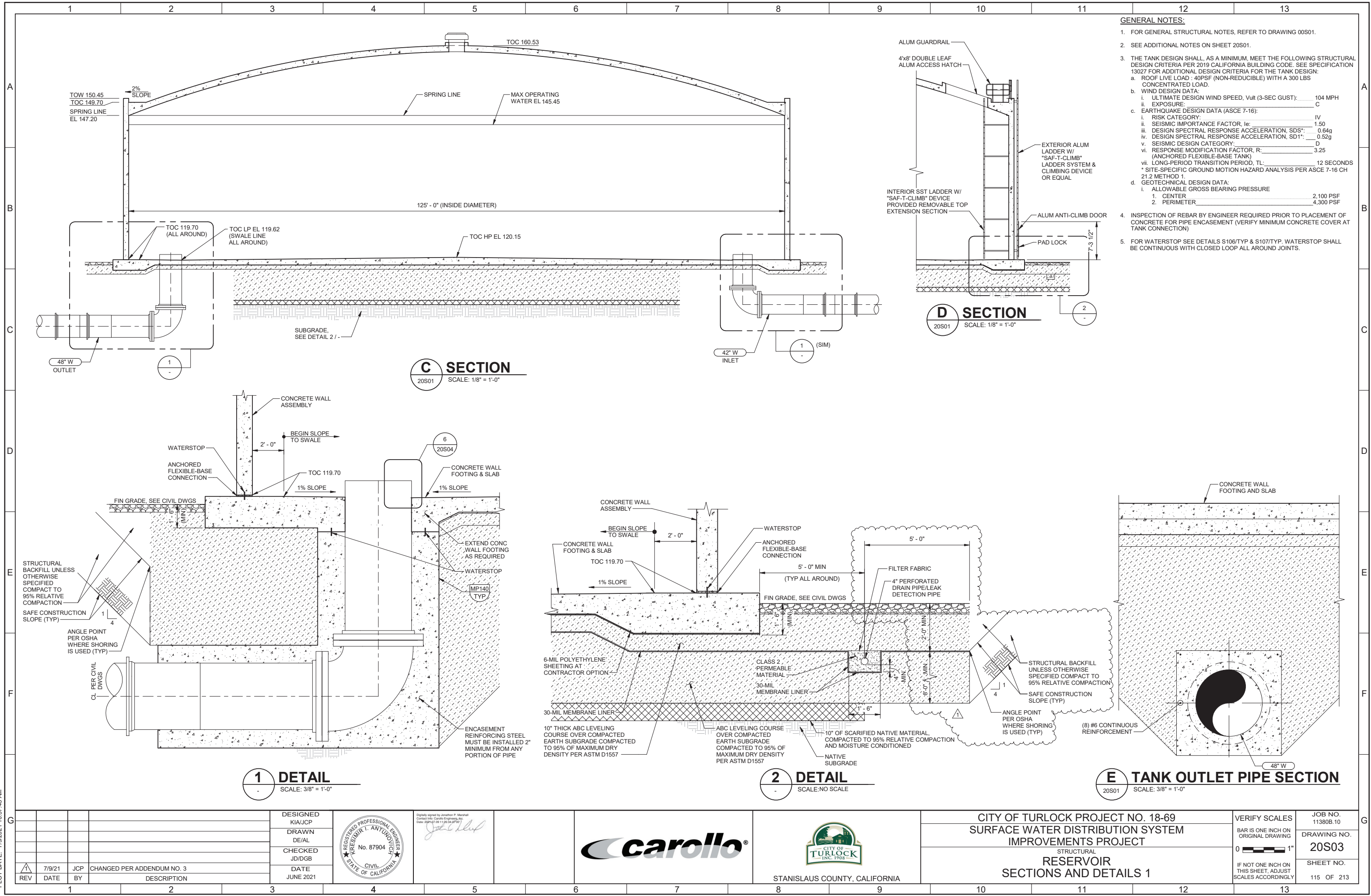


- GENERAL NOTES:
- FOR GENERAL STRUCTURAL NOTES, REFER TO DRAWING 00S01.
 - SEE DRAWING 20S03 FOR THE TANK DESIGN CRITERIA.
 - THE TANK SHALL BE AN AWWA D110, TYPE I, STRAND WOUND, PRESTRESSED CONCRETE TANK DESIGNED AND CONSTRUCTED BY QUALIFIED TANK CONTRACTOR IN ACCORDANCE WITH THE REQUIREMENTS SET FORTH IN SPECIFICATION 13207.
 - DRAWINGS SHOW THE GENERAL ARRANGEMENT FOR AWWA D110, TYPE I TANK. DETAILED ASPECTS OF THE TANK, INCLUDING SHOTCRETE, WATERSTOPS, BEARING PADS, REINFORCING STEEL, PRESTRESSING CONNECTIONS, SEISMIC CABLES, JOINTS, ETC. ARE NOT SHOWN.
 - THE HORIZONTAL LIFELINE FALL PROTECTION SYSTEM SHALL BE COMPRISED OF COMPONENTS MANUFACTURED BY DBI-SALA FOR THE SAFE LINE SYSTEM. THE INSTALLED SYSTEM AND ALL ASSOCIATED COMPONENTS SHALL MEET ALL APPLICABLE OSHA SAFETY REGULATIONS.
 - ALL STAINLESS STEEL SHALL BE A MINIMUM OF 316/316L FOR WELDING FABRICATIONS UNLESS NOTED OTHERWISE.

B ROOF PLAN
SCALE: 1/8" = 1'-0"

<div>DESIGNED KIA/JCP</div> <div>DRAWN DE/AL</div> <div>CHECKED JD/DGB</div> <div>DATE JUNE 2021</div>				<div></div> <div>Digitally signed by Jonathan P. Marshall Contact Info: Carollo Engineers, Inc. Date: 2021.07.19 11:23:25 -0700</div>	<div></div> <div>STANISLAUS COUNTY, CALIFORNIA</div>	<div>CITY OF TURLOCK PROJECT NO. 18-69 SURFACE WATER DISTRIBUTION SYSTEM IMPROVEMENTS PROJECT</div> <div>STRUCTURAL RESERVOIR TOP PLAN</div>	<div>VERIFY SCALES BAR IS ONE INCH ON ORIGINAL DRAWING 0 1"</div> <div>IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY</div>	<div>JOB NO. 11380B.10</div> <div>DRAWING NO. 20S02</div> <div>SHEET NO. 114 OF 213</div>				
1	2	3	4	5	6	7	8	9	10	11	12	13

PLOT DATE: 7/8/2021 6:08:48 PM



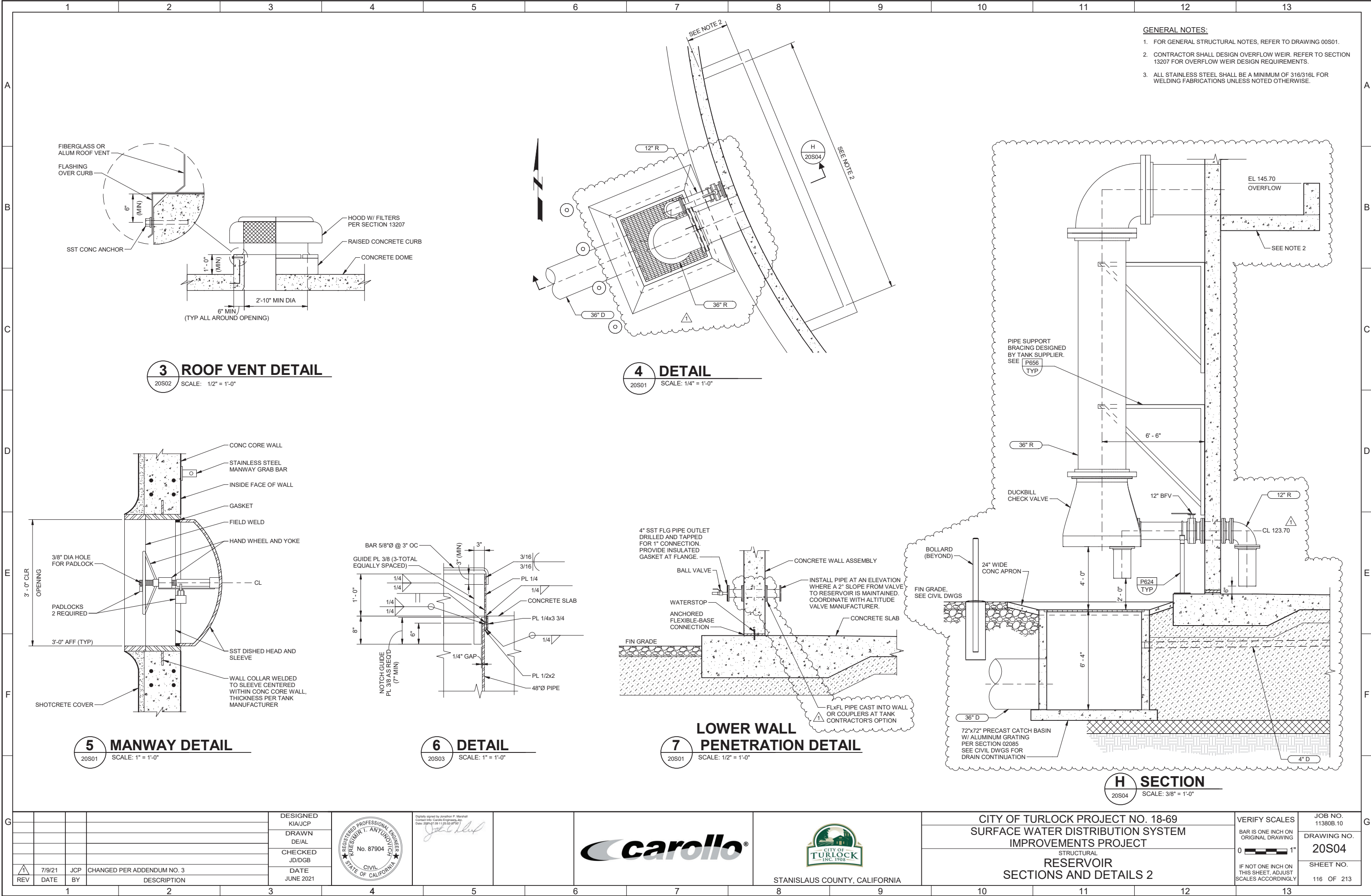
- GENERAL NOTES:**
- FOR GENERAL STRUCTURAL NOTES, REFER TO DRAWING 00S01.
 - SEE ADDITIONAL NOTES ON SHEET 20S01.
 - THE TANK DESIGN SHALL, AS A MINIMUM, MEET THE FOLLOWING STRUCTURAL DESIGN CRITERIA PER 2019 CALIFORNIA BUILDING CODE. SEE SPECIFICATION 13027 FOR ADDITIONAL DESIGN CRITERIA FOR THE TANK DESIGN:
 - ROOF LIVE LOAD : 40PSF (NON-REDUCIBLE) WITH A 300 LBS CONCENTRATED LOAD.
 - WIND DESIGN DATA:
 - ULTIMATE DESIGN WIND SPEED, V_{ult} (3-SEC GUST): 104 MPH
 - EXPOSURE: C
 - EARTHQUAKE DESIGN DATA (ASCE 7-16):
 - RISK CATEGORY: IV
 - SEISMIC IMPORTANCE FACTOR, I_e : 1.50
 - DESIGN SPECTRAL RESPONSE ACCELERATION, SDS^* : 0.64g
 - DESIGN SPECTRAL RESPONSE ACCELERATION, $SD1^*$: 0.52g
 - SEISMIC DESIGN CATEGORY: D
 - RESPONSE MODIFICATION FACTOR, R : 3.25(ANCHORED FLEXIBLE-BASE TANK)
 - LONG-PERIOD TRANSITION PERIOD, T_L : 12 SECONDS

* SITE-SPECIFIC GROUND MOTION HAZARD ANALYSIS PER ASCE 7-16 CH 21.2 METHOD 1.

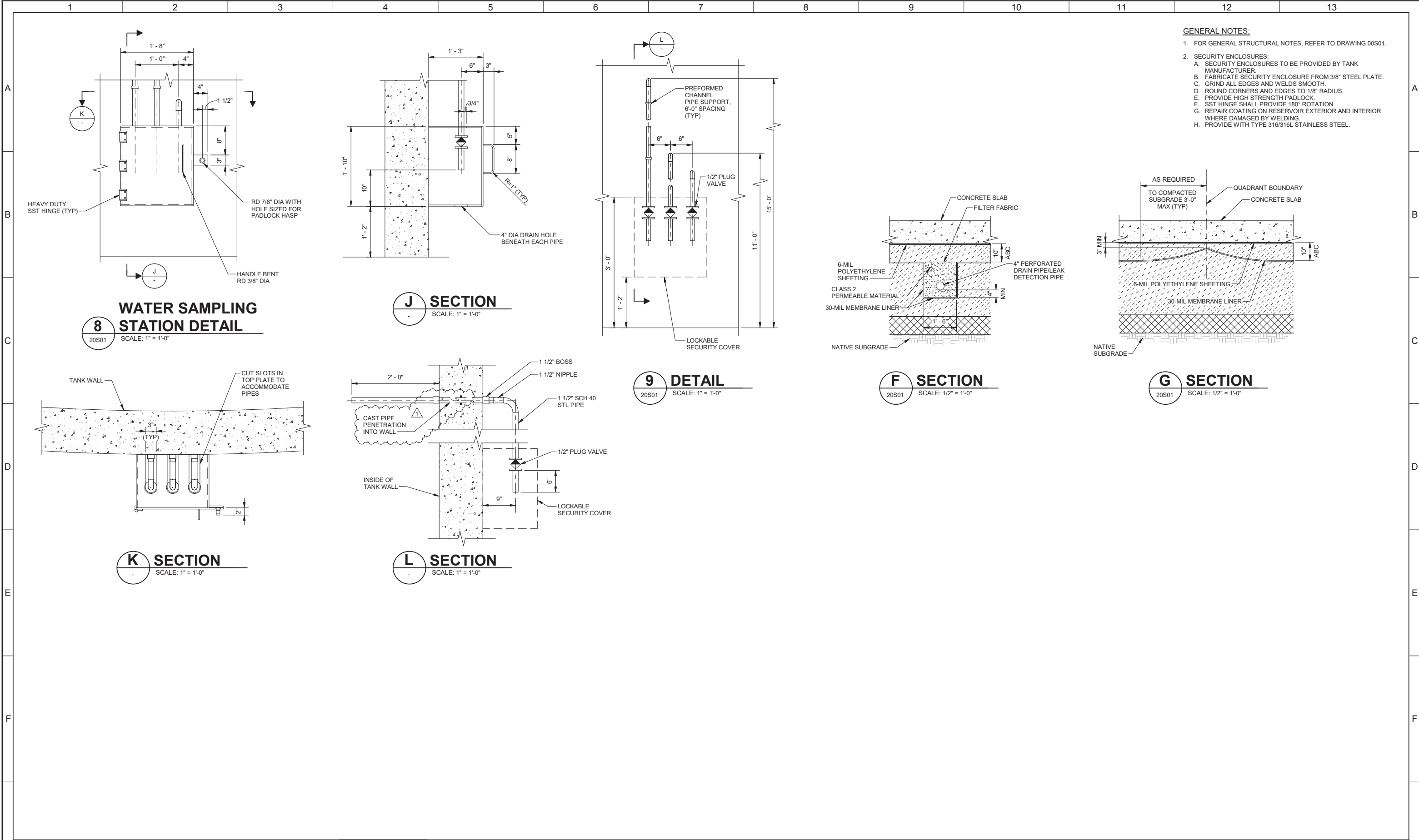
 - GEOTECHNICAL DESIGN DATA:
 - ALLOWABLE GROSS BEARING PRESSURE
 - CENTER 2,100 PSF
 - PERIMETER 4,300 PSF
 - INSPECTION OF REBAR BY ENGINEER REQUIRED PRIOR TO PLACEMENT OF CONCRETE FOR PIPE ENCASEMENT (VERIFY MINIMUM CONCRETE COVER AT TANK CONNECTION)
 - FOR WATERSTOP SEE DETAILS S106/TYP & S107/TYP. WATERSTOP SHALL BE CONTINUOUS WITH CLOSED LOOP ALL AROUND JOINTS.

PLOT DATE: 7/9/2021 10:57:43 AM

FILE NAME: R:\d1149709\11380B1020S801.rvt



PLOT DATE: 7/9/2021 11:10:39 AM



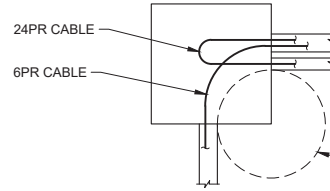
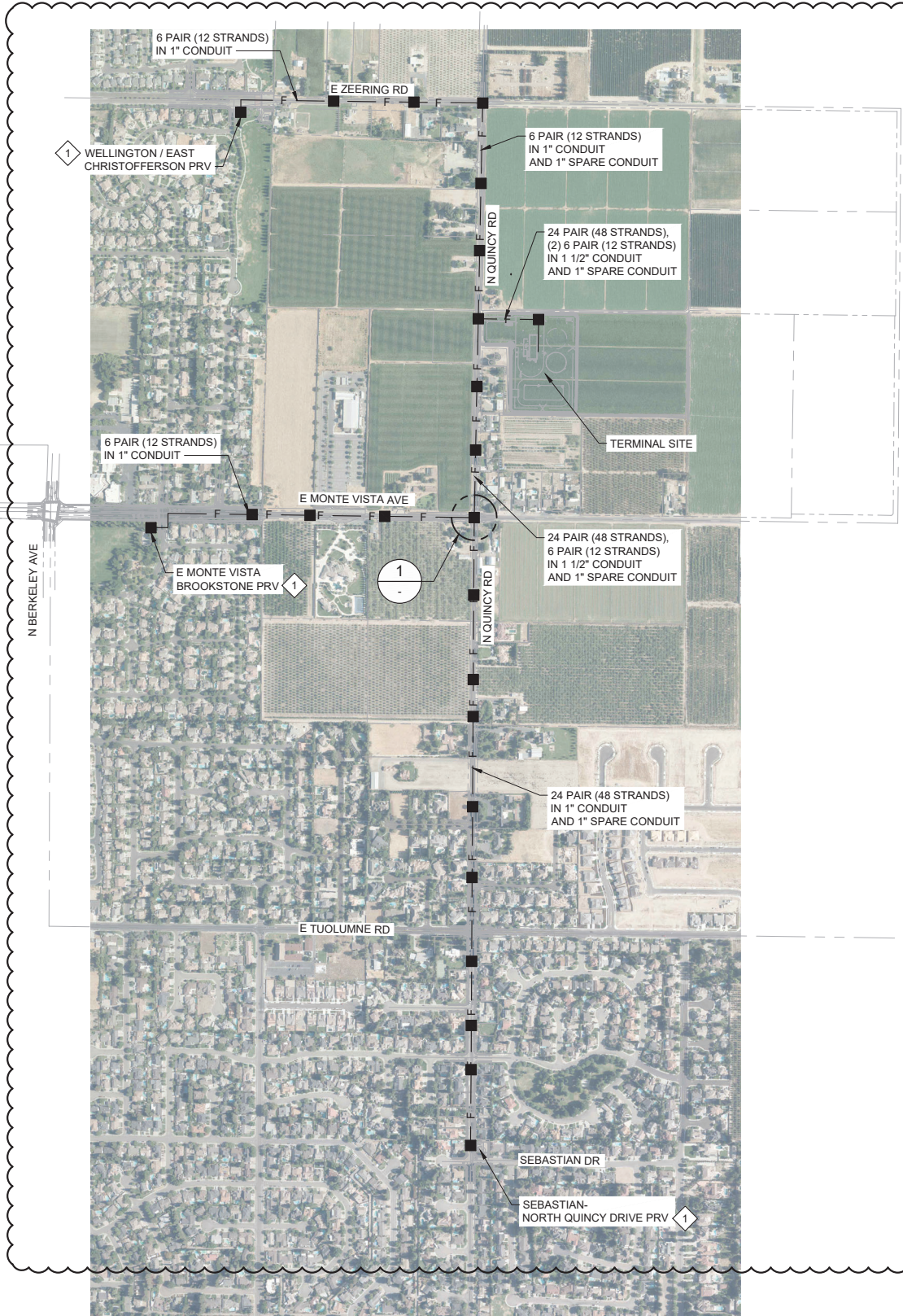
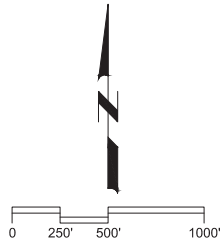
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Plot Date: 7/8/2021 5:11:42 PM

FILE NAME: 11380B1010N01.dwg

PROJECT NO. 11380B10

LAST SAVED BY: Alalga



DISTANCE BETWEEN THE OUTSIDE OF THE CONDUIT AND THE INSIDE OF THE PULLBOX WALL IS RECOMMENDED TO BE 1.5x MINIMUM BEND RADIUS OF THE FIBER OPTIC CABLE. ASSUMING THE CONDUIT IS FLUSH WITH THE PULLBOX WALL.

1 DETAIL
SCALE: NO SCALE
FILE: 11380B1010N101

GENERAL NOTES:

1. LOCATE FIBER, CONDUIT AND PULL BOXES AS SHOWN ON DRAWINGS 10P01 TO 10P17.
2. THIS PLAN DRAWING IS FOR GENERAL REPRESENTATION TO CONVEY THE ROUTING OF CONDUIT FOR FIBER OPTIC CABLE. THE MINIMUM LOCATIONS OF PULL BOXES, FIBER OPTIC CABLE SIZES AND CONDUIT SIZES. THE EXACT ENTRY OF THE CONDUIT TO THE INDIVIDUAL SITES IS NOT TO BE CONSTRUED FROM THIS DRAWING.
3. CONDUIT FOR FIBER OPTIC CABLE WILL BE ROUTED WITH THE WATER PIPE.

KEY NOTES:

1. 2 PAIR (4 STRANDS) ARE REQUIRED FOR EACH PRV. ALL EXTRA FIBER ROUTED TO VAULTS SHALL BE TERMINATED FOR FUTURE USE USING A PATCH PANEL LOCATED INSIDE THE PRV RTU.

LEGEND:

- F — FIBER OPTIC CABLE
■ PULL BOXES

A FIBER OPTIC PLAN
FILE: 11380B10N101

REV	DATE	BY	DESCRIPTION
1	7/8/21	JKR	CHANGED PER ADDENDUM NO. 3

DESIGNED	JKR
DRAWN	SS/AL
CHECKED	GB/TH
DATE	JUNE 2021



Digitally signed by Jonathan P. Marshall
Contact Info: Carollo Engineering, Inc.
Date: 2021.07.08 11:50:27 -0700



STANISLAUS COUNTY, CALIFORNIA

CITY OF TURLOCK PROJECT NO. 18-69
SURFACE WATER DISTRIBUTION SYSTEM
IMPROVEMENTS PROJECT
INSTRUMENTATION
**SCHEMATIC FIBER OPTIC
PLAN**

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO.
11380B.10

DRAWING NO.
10N01

SHEET NO.

199 OF 213

IRRIGATION NOTES

- ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH LOCAL & STATE CODES & STANDARDS.
- THE SPRINKLER SYSTEM IS DESIGNED TO OPERATE AT 20 PSI. THE CONTRACTOR IS TO PERFORM A STATIC AND DYNAMIC PRESSURE TEST; VERIFY AT LEAST 60 PSI, STATIC AND THEN RECORD THE PRESSURE READING AT 25 GPM, REPORT THE FINDINGS TO THE LANDSCAPE ARCHITECT. IF THE CONTRACTOR FAILS TO DO SO, THE CONTRACTOR WILL TAKE FULL RESPONSIBILITY FOR ANY NECESSARY REVISIONS.
- THE INTENT OF THIS IRRIGATION SYSTEM IS TO PROVIDE THE MINIMUM AMOUNT OF WATER REQUIRED TO SUSTAIN GOOD PLANT HEALTH. CONTRACTOR SHALL GUARANTEE 100% COVERAGE OF SYSTEM.
- CONTRACTOR TO PROVIDE PROPER CONNECTION REQUIREMENTS AND COMPATIBILITY FOR IRRIGATION CONTROLLER.
- SPLICING OF 24 VOLT WIRES IS NOT PERMITTED EXCEPT IN VALVE BOXES. LEAVE A 36" LONG, 6" DIAMETER COIL OF EXCESS WIRE AT EACH SPLICE AND A 36" LONG EXPANSION LOOP EVERY 100 FEET ALONG WIRE RUN, TAPE WIRE TOGETHER EVERY TEN FEET, TAPING WIRES IS NOT REQUIRED INSIDE SLEEVES, RUN WIRE FROM EACH REMOTE CONTROL VALVE TO THE CONTROLLER, ALL CONTROLLER WIRES TO BE INDEXED AT VALVES AND CONTROLLER.
- ONE VALVE PER 14" x 19" BOX WITH ISOLATION GATE VALVE. PLASTIC VALVE COVERS TO BE GREEN IN COLOR, LIDS TO BE T-STYLE NON-HINGED COVERS MARKED IRRIGATION. BOX BODY SHALL HAVE KNOCK-OUTS WITH BOLT-DOWN LIDS.
- INSTALL NEW REMOTE CONTROL VALVE BOXES 12" FROM WALK, CURB, LAWN, HEADER BOARD, BUILDING, OR LANDSCAPE FEATURE. AT MULTIPLE VALVE BOX GROUPS, EACH BOX SHALL BE AN EQUAL DISTANCE FROM THE WALK, CURB, LAWN, ETC. AND EACH BOX SHALL BE 12" APART, SHORT SIDE OF RECTANGULAR VALVE BOXES SHALL BE PARALLEL TO WALK, CURB, LAWN, ETC.
- CONTRACTOR SHALL STABILIZE IRRIGATION VALVES DURING CONSTRUCTION UNTIL BACKFILLING IS COMPLETED.
- THIS PLAN IS DIAGRAMMATIC. ALL PIPING, VALVES, ETC. SHOWN WITHIN PAVED AREAS IS FOR DESIGN CLARIFICATION ONLY AND SHALL BE INSTALLED IN PLANTING AREAS. AVOID ANY CONFLICTS BETWEEN THE SPRINKLER SYSTEM AND PLANTING AND ARCHITECTURAL FEATURES.
- THE CONTRACTOR SHALL FLUSH ALL LINES AND ADJUST ALL HEADS FOR MAXIMUM PERFORMANCE.
- ALL PVC SLEEVES UNDER PAVEMENT AND ROADWAYS TO BE SCH. 40. SLEEVES TO BE TWICE THE DIAMETER OF PIPE OR WIRE BUNDLE THAT WILL PASS THROUGH SLEEVE. CHANGE ALL RING-TITE PIPE THAT WOULD PASS THROUGH SLEEVES TO CLASS 315 SOLVENT WELD PIPE OF SAME SIZE.
- SUBSTITUTION FOR IRRIGATION EQUIPMENT SPECIFIED ON THE PLANS MAY BE DONE ONLY WITH THE APPROVAL OF THE OWNER'S REPRESENTATIVE.
- PROVIDE A MINIMUM 24" COVER OVER ALL MAIN LINE PIPING AND 18" OVER ALL LATERAL LINES.
- THE CONTRACTOR SHALL NOT INSTALL THE SYSTEM AS DESIGNED WHEN IT IS OBVIOUS IN THE FIELD THAT OBSTRUCTIONS OR GRADE DIFFERENCES EXIST THAT WERE NOT IDENTIFIED IN THE DRAWINGS. SUCH CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE. OTHERWISE, THE CONTRACTOR MUST ASSUME FULL RESPONSIBILITY FOR ANY NECESSARY REVISIONS.
- ALL WIRE CONNECTIONS TO BE MADE IN VALVE BOX WITH WATER TIGHT CONNECTORS PER THE MANUFACTURERS DIRECTIONS. WIRE SPLICES SHALL NOT BE PERMITTED UNLESS APPROVED BY THE OWNER'S REPRESENTATIVE. WIRE SPLICE LOCATIONS MUST BE INDICATED ON "AS-BUILTS" PER THE SPECIFICATIONS.
- ALL PIPE 2 1/2" AND SMALLER TO BE SOLVENT WELD AND ALL PIPE 3" AND OVER TO BE RING-TITE.
- SEE IRRIGATION DETAILS FOR ADDITIONAL INFORMATION.

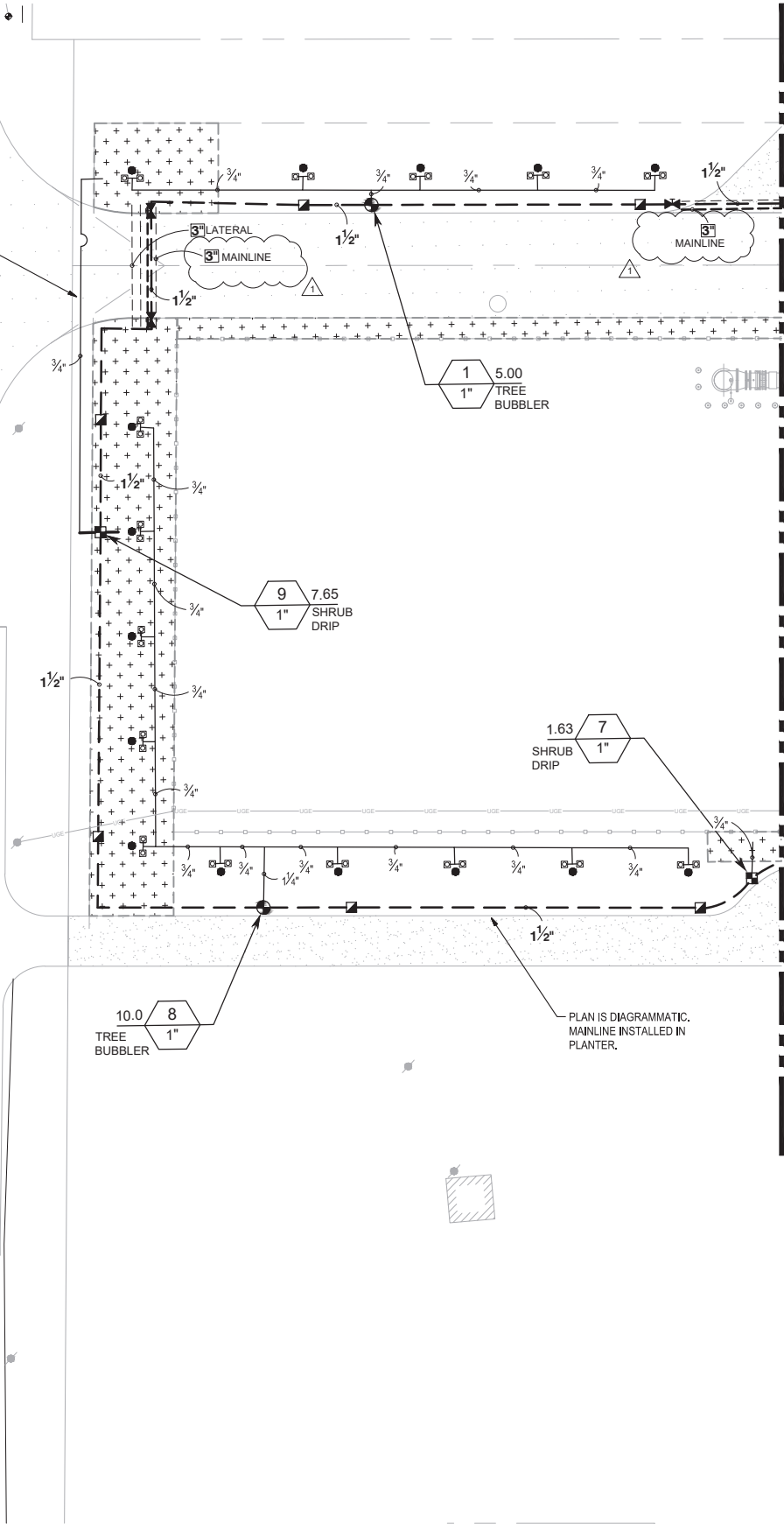
IRRIGATION EQUIPMENT AND PIPING IS DIAGRAMMATIC FOR GRAPHICAL CLARITY.

- ALL PIPING, VALVES, ETC. SHOWN WITHIN PAVED AREAS IS FOR DESIGN CLARIFICATION ONLY AND SHALL BE INSTALLED IN PLANTING AREAS WHERE POSSIBLE.
- AVOID ANY CONFLICTS BETWEEN THE IRRIGATION SYSTEM AND PLANTING AND ARCHITECTURAL FEATURES.

PLAN IS DIAGRAMMATIC. MAINLINE AND LATERALS TO BE INSTALLED IN PLANTER.

P T H M B X Q N C

B V L



IRRIGATION LEGEND

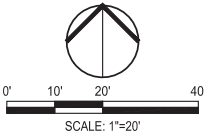
SYMBOL	MANUFACTURER/MODEL/DESCRIPTION	QTY
	Rain Bird RWS-B-C-SOCK Root Watering System with 4.0" diameter x 36.0" long with locking grate, semi-rigid mesh tube, Check Valve and Sand Sock. Rain Bird bubbler 1402 0.5 gpm, 2 per tree, typical	166
	Rain Bird XCZ-100-PRB-COM Wide Flow Drip Control Kit. 1" Ball Valve with 1" PESB Valve and 1" Pressure Regulating 40psi Quick-Check Basket Filter. 0.3gpm to 20gpm.	3
	Rain Bird MDCFCAP Dripline Flush Valve cap in compression fitting coupler.	3
	Rain Bird ARV050 1/2" Air Relief Valve.	3
	Rain Bird OPERIND Drip System Operation Indicator located within 8" of valve.	3
	Area to Receive Drip Emitters Rain Bird PCT Pressure Compensating Threaded Low-Flow Bubblers. Offered in 5 GPH, 7 GPH, and 10 GPH models, with 1/2" FPT threaded inlet. Light Brown = 5 GPH, Violet = 7 GPH, and Green = 10 GPH. Emitter Notes: 05 gph emitters (1 assigned to each 1 gal plant) 07 gph emitters (1 assigned to each 5 gal plant)	5,392 s.f.
	Rain Bird PEB 1", 1-1/2", 2" Plastic Industrial Valves. Low Flow Operating Capability, Globe Configuration.	6
	Rain Bird 44-LRC 1" Brass Quick-Coupling Valve, with Corrosion-Resistant Stainless Steel Spring, Locking Thermoplastic Rubber Cover, and 2-Piece Body.	24
	Nibco T-113 Class 125 bronze gate shut off valve with wheel handle, same size as mainline pipe diameter at valve location.	8
	Buckner-Superior 3100 1-1/2" Normally Open Brass Master Valve	1
	Zurn 975XL 1-1/2" Reduced Pressure Backflow device	1
	Rain Bird ESP8LXME-LXMM4-LXMPED with (01) ESPLXMSM4 (2) 12 Station Capable Commercial Controller. Mounted on a Powder-Coated Metal Pedestal.	1
	Rain Bird WR2-RFS Wireless Rain/Freeze Sensor. Mounted on Building	1
	Rain Bird FS-150-B 1-1/2" Flow Sensor	1
	Point of Connection 1-1/2" Point of Connection on Mainline pipe to be installed with a 1-1/2" Mainline Isolation Gate valve and installed in a concrete traffic rated box.	1
Irrigation Lateral Line: PVC Schedule 40		
Irrigation Mainline: PVC Schedule 40 (1-1/2")		
Pipe Sleeve: PVC Schedule 40 Typical pipe sleeve for irrigation pipe. Min. size 2x diameter of pipe being sleeved, Extend sleeves 18" beyond edges of paving or construction, typical. See plan for specific sizing.		
Valve Callout Valve Number Valve Flow Valve Size		
TREE LOCATION (PROPOSED) Layout reference, See Planting Plan sheets 40L05-40L07		
QUANTITIES MAY VARY FROM LEGEND. CONTRACTOR TO VERIFY.		

LANDSCAPE SUMMARY

TOTAL IRRIGATED LANDSCAPE AREA	7,317 SF
MAXIMUM APPLIED WATER ALLOWANCE (MAWA)	102,480 GALLON/YR
ESTIMATED TOTAL WATER USE (ETWU)	84,346 GALLON/YR

I SHALL COMPLY WITH THE CRITERIA OF THE MODEL WATER EFFICIENT LANDSCAPE ORDINANCE AND APPLIED THEM FOR THE EFFICIENT USE OF WATER IN THE LANDSCAPE AND IRRIGATION DESIGN PLANS.

ROBERT J. NORBUTAS, JR., RLA 5595



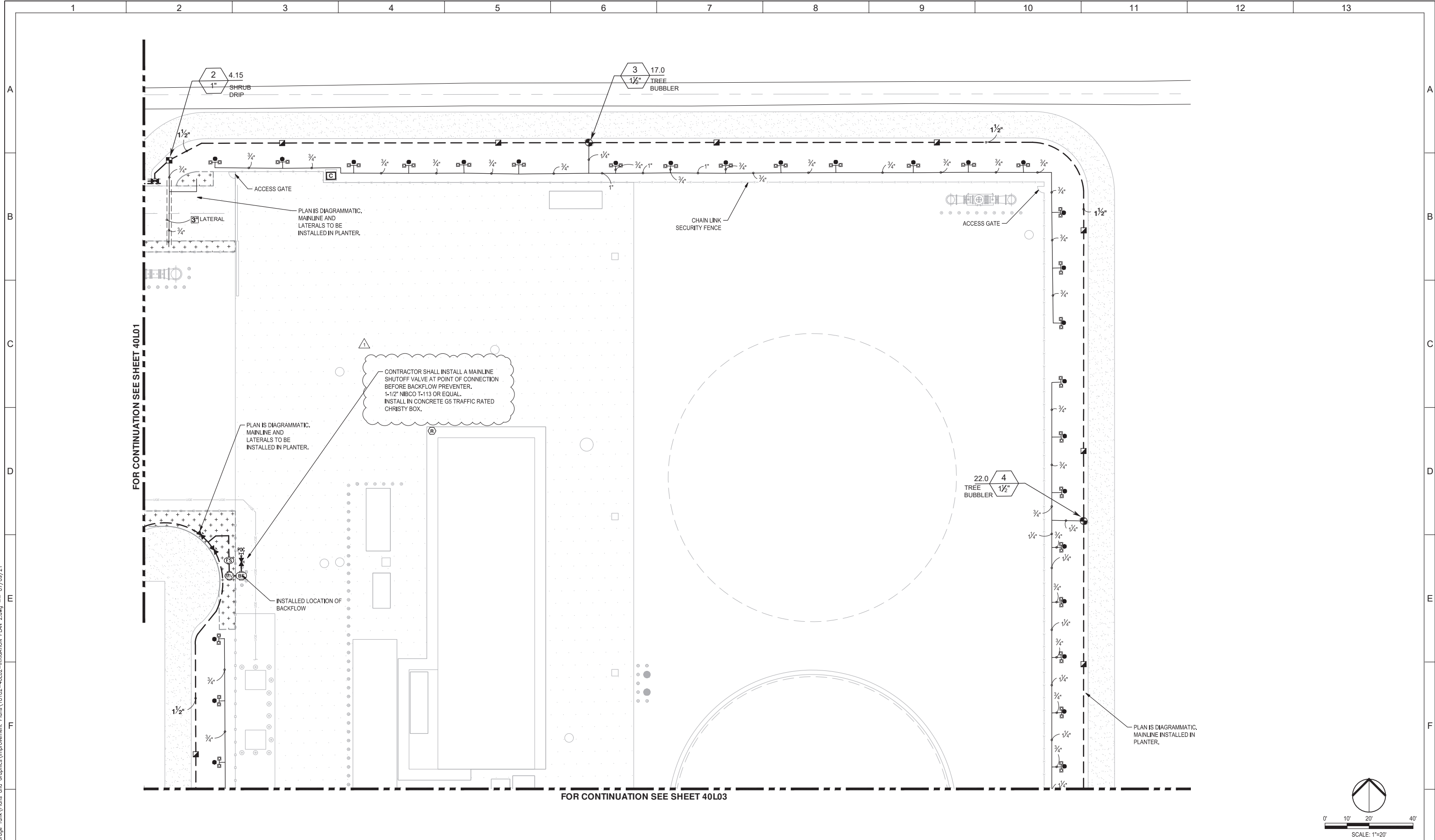
				DESIGNED R/JN
				DRAWN R/JN
				CHECKED
				DATE JUNE 2021
REV	DATE	BY	DESCRIPTION	
	7/8/21	R/JN	CHANGED PER ADDENDUM NO. 3	



STANISLAUS COUNTY, CALIFORNIA

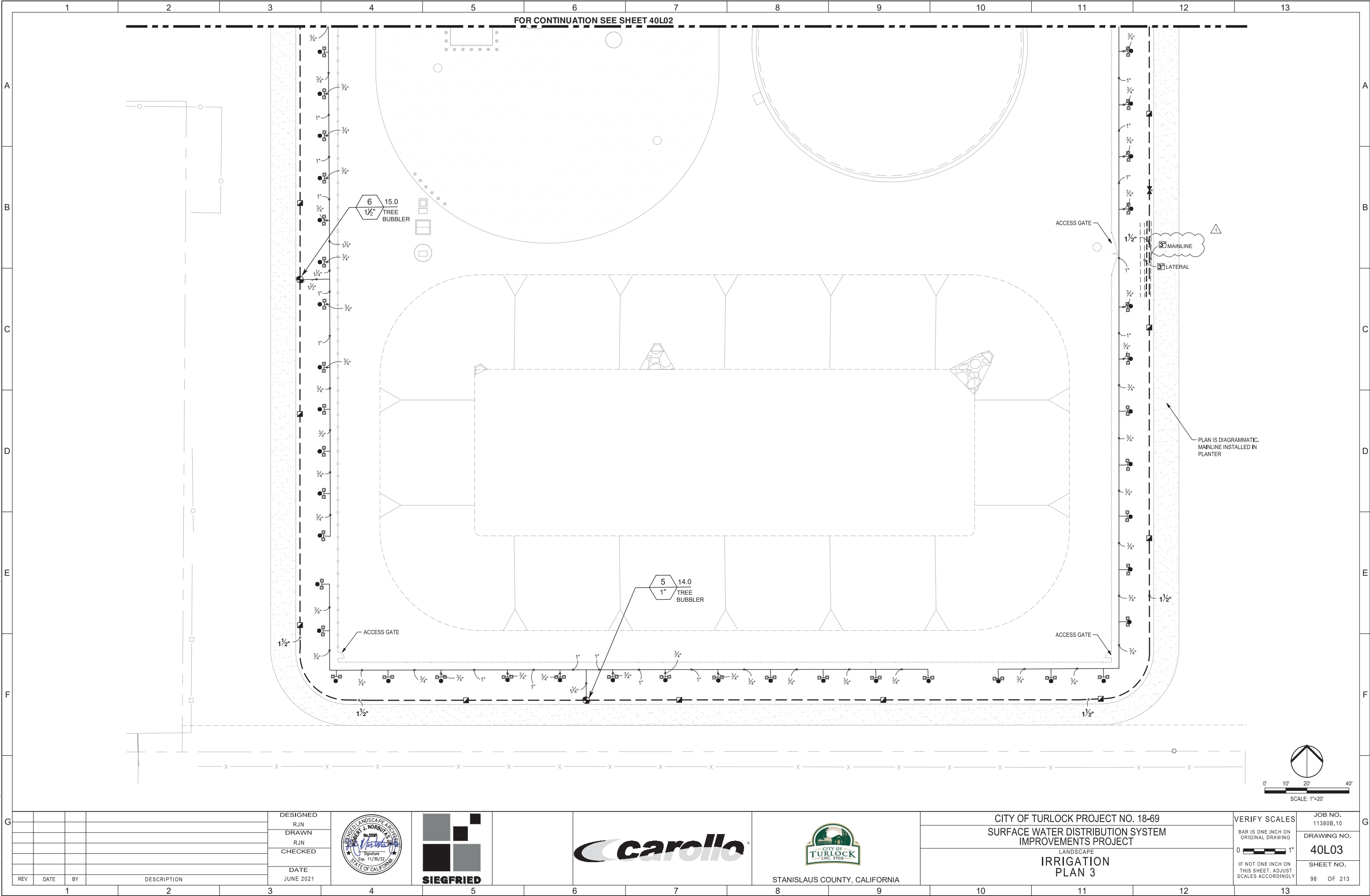
CITY OF TURLOCK PROJECT NO. 18-69
SURFACE WATER DISTRIBUTION SYSTEM
IMPROVEMENTS PROJECT
LANDSCAPE
IRRIGATION
PLAN 1

VERIFY SCALES BAR IS ONE INCH ON ORIGINAL DRAWING 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	JOB NO. 11380B.10 DRAWING NO. 40L01 SHEET NO. 96 OF 213
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<div>DESIGNED R.J.N.</div> <div>DRAWN R.J.N.</div> <div>CHECKED</div> <div>DATE JUNE 2021</div>				<div></div> <div></div>	<div></div>	<div></div> <div>STANISLAUS COUNTY, CALIFORNIA</div>	<div>CITY OF TURLOCK PROJECT NO. 18-69</div> <div>SURFACE WATER DISTRIBUTION SYSTEM IMPROVEMENTS PROJECT</div> <div>LANDSCAPE</div> <div>IRRIGATION PLAN 2</div>	<div>VERIFY SCALES</div> <div>BAR IS ONE INCH ON ORIGINAL DRAWING</div> <div>0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY</div>	<div>JOB NO. 11380B.10</div> <div>DRAWING NO. 40L02</div> <div>SHEET NO. 97 OF 213</div>
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F:\18182_Turlock Storage Tank\Plans and Graphics\Improvement Plans\18182-40L03-IRRIGATION PLAN 3.dwg --- 07/09/21



REV	DATE	BY	DESCRIPTION

DESIGNED R.J.N.
DRAWN R.J.N.
CHECKED
DATE JUNE 2021



STANISLAUS COUNTY, CALIFORNIA

CITY OF TURLOCK PROJECT NO. 18-69
SURFACE WATER DISTRIBUTION SYSTEM
IMPROVEMENTS PROJECT
LANDSCAPE
IRRIGATION
PLAN 3

VERIFY SCALES
BAR IS ONE INCH ON
ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON
THIS SHEET, ADJUST
SCALES ACCORDINGLY

JOB NO.
11380B.10
DRAWING NO.
40L03
SHEET NO.
98 OF 213

City of Turlock - Surface Water Distribution System Improvements Project		
Questions and Answers During Bidding - Questions Received through 2021-07-08		
Question Number	Question	Answer
1	At the intersection of E. Zeering Road and E. Monte Vista Road, please provide a detail on how the fiber optic conduit from these alignments is to be tied-in to the fiber optic conduit alignment on N. Quincy Road.	See Addendum 3, Drawing 10N01 for clarification.
2	At all of the PRV's, please provide a detail on how the conduit comes off from the main line and into the PRV station.	Refer to Dwg 10E01, 10E02 and 10E03 for conduit routing.
3	Plans indicate Detail EM058 for pull box requirements. Please confirm: a) Key Note #7 eliminates the grounding cable connection. Please confirm if note also eliminates the grounding rod as identified in Key Note 2. and b) For conduit tie-in to each pull box, there is a note that refers to Detail EM070, which indicates a reinforced encased conduit. Please confirm if this is required and for what length outside of the pull box.	See Addendum 3, Drawing 00TE05 for clarification.
4	Section 16130-3.14.D.2.a states we are to use PVC Schedule 40 for straight runs and bends less than 45 degrees. Paragraph "b" states we are to use PCS for bends with total deflection of 45 degrees. This paragraph "b" would apply at all pull box locations. Please provide the length require for PCS type of pipe before and after each bend. Would paragraph "c" apply to the pull boxes?	PCS pipe is only required at the elbow fitting where exposed in the pull box.
5	Bid Item 24 provides for a quantity of 7,293 SY of Stanislaus County paving at 4" HMA over 6" of ABC. In reviewing the bid item description for Bid Item 24 in Specification Section 01220, it would appear that this is roadway paving. With the exception of the small sliver of paving at the entrance of the new pump station, see Dwg. 10C07, no other roadway paving matching the description of Bid Item 24 could be found in the plans. The site paving for the pump station meets the same requirements as Bid Item 24, however the bid item description for Bid Item 2 in Specification Section 01220 states that the site paving is supposed to be paid in this bid item. Having taken off both the roadway paving and site paving, the total amount of 4" HMA over 6" ABC paving we could identify on the Contract Plans is approximately 5% less than the Bid Item 24 Bid Quantity. Please review and confirm the Bid Quantity for Bid Item 24 and its location.	See Addendum 3, Document 00410 and Section 01220 for clarification.
6	Regarding Insurance, will the City allow us to combine our primary policies with our excess liability policies to be in compliance with the limits being required?	Section 00800 requires \$5M for Commercial General Liability (general aggregate) and \$5M for Excess or Umbrella Liability (per occurrence/general aggregate). Because both are specifically required in the limits noted, they can not be combined to meet the specified requirements.
7	On Drawing No. 0G08, General Note 6 states in part, "The Contractor shall temporarily relocate conflicting existing utilities at tie-in/connection locations and reinstall them as required to eliminate the conflict at no additional cost to the Owner." So we can accurately put a price on this work, is the City or Engineer aware of any existing utility conflicts at any of the work locations? Since these conflicting utilities could be unknown, shouldn't this conflict be a change order since the utility is unknown?	Refer to 'Utility Notes' on Dwg 00G06 and Section 02280 for information regarding unforeseen conditions. Bid Item 39 - Allowance for Unknown Utilities provides an allowance for unknown utilities.
8	On Drawing No. 0G08, General Note 9 states "The Contractor shall take all precautionary measures necessary to protect from damage existing facilities and utilities shown or not shown that are to remain in place. All facilities damaged by the Contractor's operations shall be expeditiously repaired or reconstructed to the original or better condition at the Contractor's expense without additional compensation." If the unknown utility is found during excavation activities, is the Contractor still responsible for the repairs? Could unknown utilities be set-up as an allowance item?	Refer to 'Utility Notes' on Dwg 00G06 and Section 02280 for information regarding unforeseen conditions. Bid Item 39 - Allowance for Unknown Utilities provides an allowance for unknown utilities.
9	Specification 02200 Site Clearing calls for removal, stockpile, and replacement of existing (estimated 6") stripping onsite. Specification 02802 Finish Grading 3.01. A. 1. notes "top twelve inches shall be removed from all landscape areas and disposed of offsite". Please clarify if the existing topsoil would be acceptable for use in the landscaping areas.	See Addendum 3, Section 02200 for clarification.
10	Specification 02820 1.03 Submittals C. Samples Provide polyvinyl chloride coated fabric and accessories. Section 2.03 A. Chain link Fence 1. c. 1. calls for coating: Zinc Coating, ASTM A392, Class 1. Section 2.03. A. 4. e. Coatings: 1) Galvanize 2) PVC. Please clarify the coating/finish for the chain link fence fabric.	See Addendum 3, Section 02820 for revised requirements.
11	Details 2/20S03, G/20S05 & F/20S05 Identifies a "30-MIL Membrane Liner" beneath the 10" thick ABC Leveling course below underneath the new tank. Please provide specifications for the materials and installation requirements of the liner.	See Addendum 2, Section 13207 for clarification.
12	Specification 02742A Asphaltic Concrete Paving 1.04 Submittal C. 3. Pavement reinforcement fabric. No details found calling for reinforcement fabric. Please confirm no Pavement Reinforcement fabric will be needed on this project. If required, please provide to what extent.	See Addendum 3, Section 02742A for revised requirements. Pavement reinforcing fabric is not required.
13	Drawing 10C10 Planview AH identifies an area to "Replace Paver in Kind" per the legend provided. Please provide specification and or details as to the materials and installation requirements of the pavers.	See Addendum 3, Drawing 10C10 for revised requirements. Detail for stamped concrete added.
14	The Piping Schedule in Specification Section 15052 provides that W – Water (On-Site Potable) Exposed 12-24 (inch) is to be steel. The pipe material for exposed pipe larger than 24" is not provided. Section G, Dwg. 40CD02 shows the exposed 42" Water line at the Control Valve Assembly to be DIP. Please confirm that the on-site, exposed water pipe larger than 24" is to be Ductile Iron or provide the required material.	See Addendum 3, Section 15052 for clarification.
15	Could you point me to the spec for the RTU-PR0x's as referenced on 10E05?	Refer to Drawing 10E06, General Note 1 for acceptable pedestal manufacturers.
16	Is PCM-1 to include a Radio? If so are we to program it?	There are no radios at the pressure reducing stations, only fiber optic to the terminal tank site.
17	On sheet 40CP01 / Detail 1 there looks to be a call of just six (6) HSCI anodes but on sheet 40CP02 / Detail 1 there is a note that 3" SCH 80 Conduit is to be used to route twelve (12) #8 HALAR/HMWPE Anode cables.	6 HSCI anodes is the correct amount, which is also listed in Table 1 on sheet 00CP01
18	Regarding storm drain manholes: a. Referencing City of Turlock Standard Drawing S-3, can the storm drain manholes bases be precast? b. Are the storm drain manholes required to be constructed in accordance with Section 02600 – Concrete Manholes?	Refer to Detail S-3, Drawing No. 00TP04 and Section 02600 for requirements. Precast and cast in place bases are both acceptable.
19	Can the catch basins be precast?	Per Section 02084, catch basins shall be precast.

Question Number	Question	Answer
20	On Sheet 40CD02, I noticed that the vertical bends on the bottom are labeled MJ Restrained. I assume you are wanting Flex-Ring/Lok-Ring Joints at these fittings (Self-Restrained) rather than bolted MJ with Megalugs or is this an exception area? The 15052 pipe schedule indicates Self Restrained Joints for the fitting joints in general.	Vertical bends shall be restrained per the drawings.
21	<p>Within Specification Section 16727, 105, B it states the following items that are typically provided for and installed by Division 8, are to be provided by us under division 16727?</p> <p>B. Door hardware:</p> <p>1. Security door requirements:</p> <p>a. Contractor shall be responsible for reviewing the Owner's door hardware configuration with respect to the specified security functions.</p> <p>b. Contractor shall verify the compatibility and completeness of the proposed hardware, submit drawings showing proposed security modifications and installation, and coordinate acceptable door hardware and installation techniques with the Owner.</p> <p>2. Security door requirements:</p> <p>a. Contractor shall be responsible for surveying each security door indicated on the Drawings before installation, and reviewing the existing door hardware configuration and installation conditions with respect to the specified functions.</p> <p>b. Contractor shall verify the compatibility and completeness of the proposed hardware and its installation, submit detailed drawings showing the proposed modifications and installation, and provide all equipment and services required to achieve the specified electrical and mechanical performance.</p> <p>c. Coordinate acceptable door hardware and installation techniques with the Owner Inspector.</p> <p>3. Door position switches shall be furnished and installed by Contractor. (These we do Typically Provide and Install as they are Not Part of the Hardware Set)</p> <p>4. Doors and door hardware:</p> <p>a. Electric door locks, strikes, panic hardware and power boosters and power transfer devices shall be furnished and installed by Contractor.</p> <p>b. Contractor shall modify locks, doors and doorframes as needed to provide the specified operation. All work shall be approved by the Owner Inspector.</p> <p>c. Door hardware and installation shall comply in all respects with the requirements of Public Law 101-336, Americans with Disabilities Act.</p> <p>We are Access Control / Security System Integrators, and the items listed above are typically provided by Lock and or Door providers. We provide and pull the low voltage cable And make the necessary terminations to the Hinge for electrifying the lock that was provided and installed by others. We will provide a central power supply for non-high inrush Lock power, however specialty power supplies for Von Duprin type rod retraction type doors are also usually provided as part of the door package, installed by electrical wit us then Providing and terminating required low voltage connections for lock function and integration.</p> <p>Please confirm that Division 8 will be providing and installing all electrified locking hardware, hinges and specialty power supplies where required, and Division 16 will provide and install</p>	Contractor is responsible for providing a fully operational system and coordinating subcontractors scope of supplies. The contract documents do not specify which subcontractor is responsible for providing the items in question.
22	Section 03300-1.05.D – Can the ready-mix plants use historical data in lieu of performing trial batches?	Refer to Section 03300 Part 1.05 for requirements, trial batch testing is required.
23	Quality Control – Section 01450 – Quality Control states that the Construction Manager will employ and pay for specified services of an independent firm to perform Contractor QC testing as required. Section 01460 – Contractor Quality Control Plan states that the Contractor shall have on staff a full-time dedicated QCM and shall have no supervisory or managerial responsibility over the workforce. Can this requirement of the Contractor be changed to the “Contractor’s Superintendent”? Having a full-time QCM is redundant since the CM will be inspecting the work and paying for testing.	See Addendum 3, Section 01460 for revised requirements.
24	Furthermore, Section 02300-3.04.A.1 states that confirmation tests will be performed and paid for the CM. Same Section, paragraph 2.c states the costs of confirmation tests will be paid by the Contractor. Please confirm who pays for testing.	See Addendum 3, Section 02300 for clarification.
25	Lastly, overall, there seems to be an overlap of QC responsibilities (i.e., Section 03300-1.05.H and Section 03300-3.11.B appear to be redundant). Please confirm the overall responsibility of QC for the project in terms of who pays for testing and the reporting requirements by the Contractor.	See Addendum 3, Section 03300 for clarification.
26	Bid Item 15- Inspection Manways. On the project plans, I see a total of 5 rather than the 3 on the Bid Form (2 – on 54” pipe, 1- on 48”, 2- on 42”). Is the bid form Qty incorrect or which of the 3 are included in that bid item?	See Addendum 3, Section 01220 for clarification.
27	Note #7 on the alternative to weld on a 30” outlet on 54” in the detail. We can also weld the 30” on 48” and 42” which would be more economical.	See Addendum 3, Drawing 00TP04 for clarification.
28	Drawing 00TE05 Detail EM058 Note 1 references an ELECTRICAL HANDHOLE AND MANHOLE SCHEDULE. Could you please indicate where this document is located (Drawing or Specification)	See Addendum 3, Drawing 00TE05 for clarification on handhole sizes.
29	Does the RJ limit needs to be extended back to STA 163+80 for the offset?	See Addendum 3, Drawing 10P08 for clarification.
30	On drawing 40E09, it shows a generator and a load bank. Is there a spec for the generator? Is the generator gas powered or diesel? Is there a preferred generator manufacturer? Also, is there a spec for the load bank?	Refer to Section 16232 for generator requirements. There is no load bank on this project, only a shorepower docking station for a temporary load bank or temporary genset, as shown on Dwg 40E08.

Question Number	Question	Answer
31	Section 19.07 of the Instructions to Bidders provides that "If the Contract is...awarded, Owner will award..to Bidder whose Bid is in the best interest of the Project." This statement appears to contradict Public Contract Code requiring award of contract to lowest responsive responsible bidder. Please clarify that Section 19.07 is associated with evaluation of responsibility only and not an alternate method of award.	See Addendum 3, Document 00200 for clarification.
32	The Agreement provides several liquidated damage provisions based upon an event or milestone. Please confirm if such LD's would be assessed concurrently.	See Addendum 3, Document 00520 for clarification. Milestones damages are not intended to be assessed concurrently.
33	Section 4.05(c)(1) of the General Conditions includes epidemics. Please confirm that the term "epidemics" also includes pandemics or please consider adding the term pandemics to this clause.	See Addendum 3, Section 01170 for requirements related to COVID-19 health and safety protocols.
34	Section 4.05(c) does not include material shortages and/or supply chain disruption stemming from pandemics or government (US or international) imposed lockdowns or government imposed locked downs. Please consider adding these events as justification for excusable delays and compensable delays in light of the ongoing supply chain and material shortage problems brought about in aftermath of COVID-19 as other unknown pandemics could arise resulting in similar supply/material disruption and cost escalation.	Contractor shall consider current market conditions in bid. The Contractor shall refer to Section 00700 and Section 00800 for the claim submittal and review process. See Addendum 3, Section 01170 for requirements related to COVID-19 health and safety protocols.
35	Section 7.18(A) does not limit contractor's indemnification obligations as set forth in California Civil Code Section 2782 et. seq. Please confirm that contractor will not be called upon indemnify any indemnified party for such party's sole negligence, active negligence or willful misconduct.	See Addendum 3, Document 00800.
36	Section SC-2.01(B), please confirm that in addition to any pricing premium or pricing information, that contractor may also redact any other information from its various insurance policies including, but not limited to, irrelevant endorsements, custom/manuscripted verbiage, to the extent such information is deemed proprietary by contractor and further provided that contractor makes redacted copies of its policies available to the City for City's viewing at Contractor's place of business.	Refer to Document 00700 and Document 00800 for contract requirements.
37	Section SC-12.01 of the special conditions calls for claim resolution through PCC 9204 process, but Section 00822 requires a Dispute Review Board process. Please confirm how the PCC 9204 and Dispute Review Board process dovetail? Must a claim be filed simultaneously with the inception of the Dispute Review Board process or does the institution of a Dispute Review Board process stay the time requirement to present a claim? Is the Dispute Review Board process a prerequisite to filing a PCC 9204 claim? If there is any terms and conditions conflict between the PCC 9204 and Dispute Review Board process, which terms and conditions prevail?	Section SC-12.01 shall be used for claim resolution. Per Section 00822, the Disputes Review Board shall be utilized when normal Owner-Contractor dispute resolution is unsuccessful, and is a prerequisite to the filing of litigation by either party.
38	Instructions to Bidders, Section 12.03, stipulates to list suppliers who will perform work or labor or render services in excess of ½ of 1%. Please confirm that any supplier outside of the jurisdiction of the CSLB is not required to be listed on Form 00434 regardless of the value of their work/labor/service associated with the equipment they are providing.	See Addendum 3, Document 00200 for clarification.
39	Due to the complexity of this project, we are requesting a 1-2 week extension of the bid date.	The bid date will remain July 15, 2021.
40	Please clarify what Bid item(s) the cathodic protection will fall under for the above mentioned project.	See Addendum 3, Section 01220 for clarification. Cathodic protection shall be included under Bid Item 43.
41	Section 02280, Subsurface Utility Engineering, Part 1.03 C, states the Contractor shall be responsible for field locating access points for performing CCTV inspections. Is the intent of this specification to require the contractor to access their utilities, specifically PG&E and ATT. Please provide the PG&E and ATT requirements to CCTV the utility owners existing utilities. Additionally, please provide the temporary facility requirements needed to CCTV the utilities. This will allow contractors to bid the work accordingly.	Refer to Section 01140 and Section 02280 for requirements. CCTV inspections are only required for irrigation pipeline.
42	Please provide a contact name and phone number for the SRWA project. Both projects will be working on Quincy between October 1st, 2021 to April 30th, 2022	The point of contact for SRWA will be provided to the Contractor after the project is awarded.
43	Is Fine Grading as stated in Section 02318 Trenching, Part 3.06 Pipe Embedment Zone, Letter B; required for all types of pipe listed in Letters D - H (rigid, steel, ductile iron and flexible pipe)?	Refer to Detail CP111, Drawing No. 00TC02 and Addendum 2, Section 02318 for fine-grading requirements.
44	Drawing 10P01 shows the plan and profile for 54" PW on the Access Road to the New Terminal Tank Site. Is this run of 54" Pipe considered to be part for the Yard Piping or Offsite Work?	Refer to Section 01220 for requirements. The 54-inch potable pipeline shall be included in Bid Item 2: Terminal Tank Site Sitework.
45	The City is requiring all ground disturbing work on Quincy from STA 100+00 to 114+29 and work on Zeering from STA 216+00 to Quincy to be completed by April 23rd 2022. We are currently seeing 4-5 months minimum for delivery of custom ductile iron pipe. Manufacturers cannot begin construction on the pipe until we have potholed the new alignment and completed the submittal process. The bid documents also require the contractor to list and select the pipe manufacture at bid time. This allows no flexibility for suppliers to find a manufacturers who will have the capacity to meet the milestones for this project. In addition to the market conditions, the specifications do not allow for work at night work or work on the weekend which would allow the contractor to make up time. Please consider revising this milestone date to allow for Market Conditions on Custom Ductile Iron Pipe.	The milestone date is critical and will not be changed.
46	Section 17750 outlines the Radio, Antenna, and Propagation Study requirements for this project. However, on the Network Architecture Drawing – 00N13 – Note 1: states that Radio and Scada Equipment is part of another project. Please clarify.	Key Note 1 on Drawing 00N13 is only applicable to the RWQCF, not the pump station building. The Contract Documents and Section 17750 are applicable to the pump station building.
47	The individual titled as project manager will be on site as required throughout construction such as key inspections and concrete pours. Please confirm a site Superintendent satisfies the requirement stated in specification section 13207, 3.01.A, that tank contractor shall provide a full-time on-site project manager during all aspects of tank construction. The Tank Constructor's superintendent on site full time is the industry standard for full time Tank Contractor on site representation throughout every aspect of tank construction.	"Project Superintendent" is an acceptable title in lieu of "project manager" provided that the individual meets all requirements of the specifications and industry standard of care for tank construction oversight and responsibility. Submit qualifications statement per Section 13207-1.03.E.

Question Number	Question	Answer
48	Specification 13207, Section 1.06.D.13.a, states the vent shall be sized for a rate of 750 cfm or the rate of volumetric withdrawal assuming the outlet pipe has ruptured, whichever is greater. In order to design adequate venting assemblies, please provide the rate of volumetric withdrawal assuming outlet failure.	The maximum volumetric withdrawal for vent design purposes is 37.5 million gallons per day.
49	Specification 03200, Table 2 cases b through d, require stainless steel bar supports for concrete placed against forms. Please confirm if this is applicable to the prestressed water tank, or if concrete supports are also acceptable for use, per industry standard for prestressed concrete tank construction.	Per Section 03200, Contractor shall use stainless steel bar supports.
50	Specification 03300, Table 3, states concrete class A(-NA) is to have a slump within the range of 2 to 4 inches. Please note that in order to ensure proper placement and consolidation of the concrete near the bottom of the Type I prestressed tank, it is standard tank industry practice for the slump of the wall concrete to range between 5-7 inches. This higher slump can be achieved without increasing the maximum water to cement ratio specified in Table 3 with the use of high range water reducers (super plasticizers). Please review and determine if the slump range of the concrete used for the Type I prestressed tank wall can be increased to a maximum range of 5-7 inches, as long as the maximum water to cement ratio specified in the project documents is not exceeded.	The proposed would acceptable as long as the water to cement ratio is maintained.
51	Specification 05500, Section 2.02; 2.g, Include a list of handrail/guardrail manufacturers. Please confirm if Hollaender Manufacturing Co. can be approved as an equal.	Per Article 11 in the Instruction to Bidders, substitutes and "or equal" items and manufacturers will be evaluated after project award. The Engineer is unable to confirm if the proposed manufacturer is "or equal" because manufacturer information was not submitted. If a proposed manufacturer can meet all the requirements of the project specifications, that manufacturer would be considered "or equal."
52	Specification 13207, Section 1.06.F.6.a requires 2" concrete cover on inside face of concrete for the tank walls. Please note that ACI 350 7.7.3.1 recommends a minimum cover of 1.5" over prestressed and non-prestressed reinforcing in prestressed concrete exposed to liquid. 1.5" clearance would allow for more space between elements at the base of the tank wall. Please confirm if a clearance of 1.5" is acceptable at the inside face of the prestressed tank wall.	Per Section 13207, 2" concrete cover shall be used.
53	Specification 13207, Section 1.06.F.8.c, states horizontal non-prestressed reinforcing spacing shall not exceed 12 inches on center. Please note that there is a layer of circumferential reinforcing in the wall to help support the vertical reinforcing, and an additional layer to help support the threadbars, as well as provide tie off support for the splayed seismic cables. As such, it is standard industry practice for the horizontal mild steel in the prestressed wall to be spaced at approximately 24 inches on center. Please confirm if each horizontal layer of non-prestressed reinforcing may be spaced at 24 inches on center.	The horizontal bars should be spaced no more than 12 inches on center for this project. If two layers of circumferential reinforcing spaced 24 inches on center, they could potentially be spaced 12" apart from each other in the same curtain, however not enough information is available to confirm the proposed spacing meets the project requirements.
54	Specification 13207, Section 2.01; I.6, state exterior to provide a safety cage as indicated on the drawings. Bid drawings do not include any callout requiring a safety cage around the exterior ladder. Please confirm that a safety cage is not required.	See Addendum 3, Section 13207 for revised requirements. Safety cage at exterior ladder is not required.
55	Drawing 00TP03, Detail P656, Note 1 states exterior wall brackets shall be hot dip galvanized steel. Spec 15061 Section 2.02.; B.1, state outdoor pipe support are to be made of 304 SST material. Please clarify which material type to carry out in tank design.	Detail P656, Note 1 indicates galvanized carbon steel "unless otherwise required." 304 SST requirements under Section 15061 supersede the typical detail note. See Addendum 3, Drawing 00TP03 for clarification.
56	Drawing 00TM02, Detail MP140 shows a typical detail of a concrete pipe encasement tied into a structure floor with reinforcing. Please confirm if it is acceptable to have the reinforcing in the pipe block terminate with the pipe block, with a slip connection between the prestressed tank floor and pipe blocks.	Tank designer may submit proposed slip connection during the submittal process for Engineer review. Engineer will determine whether the proposed is acceptable during review. Not enough information has been provided to make the determination at this time.
57	Drawing 20S03, Section C, shows a roof TOC elevation of 159.70. Please note that we believe a tank with TOW 149.95 would require a roof TOC elevation of 160.03. Additionally, it is recommended to increase the wall height 6" to accommodate the seismic slosh wave in the tank; TOW elevation would be 150.45. Please note that this would require a roof TOC elevation of 160.53, not including the vent. Please confirm if structure's TOC can increase by 6" and TOC at dome center without vent of 160.53 is acceptable, or if the dome is to be designed for uplift pressures.	See Addendum 3, Drawing 20S03 for revised requirements.
58	Drawing 20S04 Detail 5 shows a manway detail, however we were unable to locate an install elevation required. In order to optimize the prestressing design, we have assumed a centerline elevation 5'-0" above finished floor. Please confirm this is acceptable.	Install bottom of manway at 3'-0" above the finished floor per Det. 5/20S04.
59	Drawing 20S04 Section H shows the drain pipe penetration through wall at elevation 122.28. In order to provide adequate space to apply displaced prestressing strand above and below the penetration, we recommend placing the drain pipe, and the lower wall penetration in Detail 7, at a centerline elevation of 123.7. This would have the added benefit of placing the lower pipe penetrations in the same "no-wrap" area as the manways. Please confirm this is acceptable.	Revised elevation is acceptable. See Addendum 3, Drawing 20S04 for revised elevation.
60	Drawing 20S04 Detail 7 and Section H, as well as Drawing 20S05 Section L, show pipe penetrations through the prestressed tank wall. To facilitate prestressing operations, we request that flange x flange pipe spools be cast in the tank wall, flush with both faces of the wall, with additional piping installed after prestressing operations are completed. For smaller pipes such as the sampling lines, couplers may be placed in lieu of flanged connections. Please review and confirm this is acceptable for all pipe penetrations through the prestressed tank wall.	See Addendum 3, Drawing 20S04 and Drawing 20S05 for revised requirements. Pipe spools cast in place shall include a weep ring to control water penetration.
61	What is also unclear is that you want a VTSCADA package that will take care of this portion, but then will get incorporated into a larger system. I am in discussions with VTSCADA about a reasonable solution to that. I think he may be reaching out to someone there. I am talking to Dan Naughton out of IL, but he said his boss was talking to the team out there. I don't have his name. Is the other SCADA project something that is in the works and out for bid soon?	VTSCADA license will be provided to the Contractor. Information is not available at this time regarding the City's SCADA project.
62	Specification Section 02772, Paragraph 2.02 A. states that Class A concrete is to be used for curbs, gutters and sidewalks. Specification Section 03300, Paragraph 2.06 E.5 provides that Class PM concrete is to be used for curbs, gutters and sidewalks. Please clarify.	See Addendum 3, Section 03300 for clarification.

Question Number	Question	Answer
63	Drawings 40C02 thru 40C04 callout a No. 2 Crushed Stone as one of the finish materials for the site. This material does not appear to be listed in Specification Section 02050 and cannot be found elsewhere in the specifications. Please identify where the requirements for this material can be located.	See Addendum 3, Section 02050 for clarification.
64	Keynote 3, Drawing 40C02 and Specification Section 01140, Paragraph 1.07 I. require the demolition of the existing on-site "groundwater well". No details regarding the size and depth of the well have been provided, nor do the drawing provide any information regarding any existing utilities that may be connected to the well other than the overhead powerline that is shown. Please provide any additional information that may be available regarding the construction of the existing well.	See Addendum 3, Section 01140 for clarification.
65	In the Agreement, Article 4 Section 4.02 B.10 states "The Contractor shall assume treated water that meets DDW requirements will be delivered from the SRWA WTP to the terminal tank on April 15, 2023. The Contractor shall begin Phase 2 commissioning (i.e., temporary pumping to the distribution system) as defined in specification 01756 at this time." a. Is substantial completion tied to the successful completion of Phase 1 commissioning or Phase 2? b. If based on Phase 2 commissioning, if the water delivery begins 4/15/2023 and Phase 2 commissioning takes 171 calendar days (90 days for pumping water, 21 days for Project commissioning and operational period, and 60 days for PCIS Optimization and fine tuning), that would push substantial completion beyond what's stated in the bid docs. Please confirm.	a. Refer to Section 01756, 1.10. Substantial completion is tied to the successful completion of Phase 2 testing. B. See Addendum 3, Section 01756 and Section 17950 for revised requirements for the commencement and duration of the PCIS period.
66	I was looking through the addendum 2 that was issued and included is the 09960 coatings specification and two systems were deleted from the original specification but there is no mention of this in the new addendum. Attached is the highlighted original specification and the missing systems from the issued addendum. Is this a mistake or are these systems suppose to be deleted from the scope?	The version of 09960 included in Addendum 2 (pg. 534 of the PDF in Appendix I – Pump, Motor, and VFD package) is the coating specification provided to the pump supplier and only lists coatings relevant to the separate procurement package (three coating systems). The noted coating systems (EPX-C-2 and EPX-F-1) remain as part of the 09960 specification under the Surface Water Distribution System Improvements Project (five coating systems). This specification has not been modified by addendum.
67	Specification 13207, Section 1.05.A.2.b changed via addendum 2, states tank contractor shall employ entire Tank Construction project team. Please confirm Tank Construction project team members can be made up of individuals from both Tank Contractor and Tank Prestressor.	See Addendum 3, Section 13207 for clarification.
68	Specification 13207, Section 1.05.A.2.b changed via addendum 2, states tank contractor's shall have constructed in the last ten years a minimum of five AWWA D110 Type I tanks with domed concrete roofs having a capacity of 1.0 MG or greater. Please confirm flat slab concrete roofs are also acceptable for experience.	See Addendum 3, Section 13207 for clarification.
69	Specification 13207, Section 1.05.A.1.a.2 changed via addendum 2, states The Tank Contractor shall have a working agreement with the Tank Prestressor in which the Tank Contractor is approved by the Tank Prestressor to perform all construction of the specified tank except the prestressing. Please confirm Tank Prestressor shall be a subcontracted to Tank Contractor meeting the AWWA D110 Type I qualifications as defined in this specification.	See Addendum 2, Section 13207 for clarification. The Tank Contractor may subcontract with a Tank Prestressor for the design and construction of the tank.
70	Sheet 87 - Can you clarify what grading work, if any, is required for future reservoir?	Refer to Drawing 40C03 for grades for future reservoir. Overexcavation for the future tank is not required.
71	Sheet 115 – Can you clarify limits of the over-build area for the 10' excavation?	See Addendum 3, Drawing 20S03 for clarification.
72	The plan sheets show for ceiling joists, roof truss blocking, cmu wall top plate, fascia boards, edge lookers and sharp ridge blocking to be 3 X materials, was it the engineers intention to "double up" thickness of all rough carpentry? The engineers drawing represents a single thickness of material, are we to use 4"x8" material and ripped to 3" or can we use 2 - 2"x12" which have a nominal thickness of 1 1/2" to achieve the correct 3" thickness?	Contractor shall construct ceiling joists, roof truss blocking, cmu wall top plate, fascia boards, edge lookers and sharp ridge blocking as shown in the drawings. The Engineer will consider "or equal" proposals during submittal review.
73	Plans show bollards with CF161 Typical near all of them, does the engineer intend for all bollards on the various locations to be removable, please advise how many are removable and how many are stationary.	Bollard types are shown on the drawings and vary by location. Contractor is responsible for performing quantity take-offs.
74	Regarding the aluminum grating, It's spec'd. to be 1 1/2" thick H-20 rated grating. according to McNichols grating, this means it must support 18,000 ksi - 36,000 ksi. From what they tell me, this grating can not be aluminum, it must be carbon steel to meet that rating. Please confirm.	Refer to Drawing 00TC06 for catch basin grating requirements, catch basins are required to have H20 rated grating.
75	sheet 00TM01, detail M243 calls for aluminum grating also, refer to question 019 above, please clarify.	Refer to Drawing 00TM01 for sump grating requirements, sumps are required to have aluminum grating.
76	If galvanized grating is required based on question 019 above, will we then make the embeds out of carbon steel also?	Refer to Drawing 00TM01 for sump grating requirements.
77	Regarding the embeds on S542/OOTS06 for the grating, does it matter if we use detail "A" or "B"?	Detail "B" is an alternative to Detail "A". Each alternative is acceptable.
78	There is not a bid item for Landscaping and irrigation & Fencing, do you intend the costs of this work to be split into the various items of work, or is it acceptable to put it into item 43 All other work required?, and if so, will it be paid by percentage of work progress?	See Section 01220, Bid Item 2 which includes landscaping, irrigation and fencing.
79	There are callouts on the plans for Tilted Disc Check Valves. There is no specification for a tilted disc check valve, only for Surgebuster Check valves. Should the plan call out be for Surgebuster Valves or is the call out correct. If the requirement is for tilted disc check valves we will require a specification for these valves. The specification should include if an oil dampening system is required and if so if it is to be bottom or top mounted. We have not been able to locate a specification for the plug valves, please provide.	See Addendum 3, Section 15114 for requirements.
80		See Addendum 3, Section 15116 for requirements.
81	Do any of personal gates ornamental iron or chain link have any type of panic hardware ?	No.
82	In section 2.03 Materials, #4 for barbwire mentions T-Posts, there is no detail showing T-Posts for a barbwire fence, are T-posts part of the fence or is the barbwire mentioned for the top of the chain link fence. Please clarify.	Refer to Drawing 00TC01. Barbed wire shall be installed in accordance with the drawing.
83	Is the chain link fence material including the barbed wire all PVC vinyl coated material. Please clarify.	See Addendum 3, Section 02820 for clarification.

Question Number	Question	Answer
84	Drawing 20S04 Note 2 states that the contractor shall design the overflow weir based on Specification 13207 criteria of 33,300 gpm with maximum 9inch water height over of the top of the overflow weir. However, the plans show a single 24" overflow pipe exiting the tank wall at the weir. We believe multiple overflow pipes may be required for a flow rate of 33,300 gpm, please confirm if multiple pipes is an option to satisfy flow rate of 33,300gpm. Or, please confirm that (1) – 24" dia. overflow pipe is adequate for the flow rate proposed, and whether the weir box may be sized for a lower flow rate and/or higher crest height to match the overflow pipe design.	See Addendum 3, Drawing 20S02 and Drawing 20S04 for revised requirements. See Addendum 3, Section 13207 for a revised design flow rate of 26,000 gpm.
85	Due to conflicting bids with other Agencies, for us to submit a competitive bid, we are requesting a 1-2 week postponement for the Surface Water Distribution System Improvements project.	The bid date will remain July 15, 2021.
86	Given the Contractor responsibilities in Specification Section 01756, Paragraph 1.10.C.2 and Specification Section 01756, Paragraph 1.10.D.9.b, are there any special permits and/or licenses required for the operation of a potable water distribution facility? Specifically, will the Contractor be required to utilize personnel that hold Distribution Operator Certificates/Licenses?	The Contract does not require Contractor personnel to hold Distribution Operator Certificates/Licenses. The City holds the appropriate operation certificates and the commissioning will be performed under the City's permit authority.
87	Under what parameters is the Contractor to operate the pump station (i.e. flow rates, pressures, durations, tank level, etc.)? Note that Contractor does not have the ability to monitor upstream nor downstream facilities.	The City will provide operational parameters to the selected Contractor during construction. See the following drawings for requested information: 00G07, 00G08, 00G14, 00G15, 00G16 for information already provided.
88	Is the City requesting that manufacturer's authorized representatives for all equipment be onsite for the entire duration of the 21 calendar day test?	Refer to Section 01756 for commissioning requirements. Refer to the technical specifications for requirements for manufacturer authorized representatives services.
89	Specification Section 02600, Paragraph 2.02 C.4.b states a requirement for a corrosion protection system for unlined concrete on manhole bases. Please clarify if this requirement is applicable to the storm drain manholes to be installed on the project.	See Addendum 3, Section 02600 for clarification.
90	We have a questions about the chain link fence specs and details. The chain link fence details shoe top rail and a bottom tension wire. In he chain link fence specs it calls out top rial or tension wire and it also calls out bottom rail and tension wire Please clarify if the chain link fence has top rail and a bottom tension wire as is shown on the chain link fence details or does it have both top and bottom rail. Please clarify	See Addendum 3, Section 02820 for clarification.
91	At the Terminal Tank Site, the plans call out for 2ea 6" Silent Check Valves. There is no specification for these valves, please provide.	Refer to Drawing 40CD03. Check valves are swing check valves. See Addendum 3, Section 15114 for requirements.
92	Typically, standard General Liability policies (for most contractors and subcontractors) are either \$1m occurrence \$2m aggregate or, at the most, \$2m occurrence \$4m aggregate. However, the insurance requirements indicate primary policy limit requirements greater than \$2m occurrence and \$4m aggregate. Moreover, the insurance requirements also state (i.e., see section 6.03(J) on page 22) that contractor must provide required policy limits with its primary policy (i.e., required policy limits cannot be met with contractor's excess/umbrella coverage). This may result in added costs as contractor's will likely need to obtain additional insurance as they are not able to utilize their excess/umbrella policy to meet the City's primary insurance limits. Please consider revising said Section 6.03(j) to provide that the policy limit requirement can be met by contractor's excess/umbrella policy that follows-form to its primary general liability policy.	The insurance policies are City standard and will not be changed.
93	Our take off of the paving of Full Road Reconstruction per detail 1 DWG 10C09 is approximately 3,700 SY, what bid item are we supposed to put this cost into? it doesn't seem to fit any of the current paving items 24-27, please advise.	See Addendum 3, Document 00410 and Section 01220 for clarification.
94	We are hearing from multiple pipe suppliers that the procurement of some of the specialized DI fittings and spools may take up to 25 weeks after approved submittals. Has this been taken into account for the overall contract duration allowed? Please clarify.	The schedule constraints are driven by SRWA WTP startup. The Contract includes early milestones to facilitate manufacturing and delivery of the pipe. Engineer would consider reviewing critical submittals before NTP.
95	Specification section 02810 page 5, article 2.07 shows Traffic-rated box if installed in roadway and other areas shall be used with plastic valve box. In this project all valves are locating within planters so the plastic valve box shall be applied. However, Details #3, #9 on sheet 40L08 and detail #1 on sheet 40L09 show valve box material are Traffic-rated concrete value box. Please clarify.	See Addendum 3, Section 02810 for revised requirements.
96	Specification section 02810, page 5, article 2.06 shows "Install main line shut off valve at point of connection in a Christy concrete G5 traffic box for Main Line Shut Off Valves". However, there is no Shut Off Valve shown on Irrigation plan. Please provide the location, detail, and model for Shut Off valve for bidding purpose.	See Addendum 3, Drawing 40L02 for clarification.
97	Irrigation note #11 on sheet 40L01 shows "Sleeve to be twice the diameter of pipe". However, call out on plan sheet 40L01 and 40L03 show 4" Sleeve for Mainline 1-1/2" and 3" Sleeve for Lateral line 1". Please clarify the size of sleeve.	See Addendum 3, Drawing 40L01 and Drawing 40L03 for clarification.
98	Please provide the detail for No. 2 crushed stone, which is shown on legend sheet 40C01.	See Addendum 3, Section 02050 for revised requirements.
99	Please specify the size of River rock material, which is shown on Keynote #1 on sheet 40C04.	See Addendum 3, Section 02050 for revised requirements.
100	Specification section 02050, article 2.04, & 2.05 shows two different materials for Gravel and Drain rock. We are not sure which section can apply for No.2 crushed stone per Legend on sheet 40C01 and which specification section can apply for River rock per Keynote #1 on sheet 40C04. Please advise.	See Addendum 3, Section 02050 for revised requirements.
101	Piping Schedule in Section 15052 states that storm drain (SD) piping test method is "GR". Section 15959-3.03.A describes the method of test. In particular, it states we are to inspect piping for visible leaks before backfilling and to keep piping full under a slight head for the water at least 24 hours and to examine the pipe for visible leaks. As mentioned in a previous question, Section 01737 allows a maximum of 40 linear feet of exposed trenching to be covered with steel plating. Can the requirement of examination of visible leaks prior to backfilling be deleted so that we can test the pipe from manhole to manhole without the pipe being exposed?	Per Section 15956, 3.03, A, 1, c, storm drains and culverts are exempt from visible leak tests and pressure tests prior to backfill. The gravity test method specified is required after backfill.

Question Number	Question	Answer
102	Detail EM015 indicates the use of Class C concrete with red dye for fiber optic conduit backfill. Section 01734-B.7 states that a maximum of 40 linear feet of steel plating is allowed to be left in the public right-of-way overnight. Can this length of steel plating be increased? This request is being asked for the reason that it will take the concrete backfill at least 24 hours to gain enough strength so the trench can be backfilled. In short, this would only allow 40' of fiber optic trench per day.	The maximum of 40 linear feet of steel plating in the public right-of-way will be dictated by City and County encroachment permit conditions. The requirement of 40 linear feet is based on preliminary discussions with each agency, however final permit conditions have not yet been established.
103	On Drawing No. 10P07, Note 3 states from Station 151+80 to 153+20 to hand excavate and/or vacuum excavate pipe trench. Is it the expectations of this Note 3 to use this type of excavation to full depth of pipeline? What is the main purpose of this requirement in this particular portion of the project?	The purpose of the requirement to vacuum excavate is to avoid impacting existing utilities located in close proximity that may be damaged by normal trenching operations.
104	Is this project subject to the Buy America or Buy American material requirements for steel products?	No.
105	Please confirm that the Chain Link Fence, Ornamental Iron Fence and the gates are all to be bid under Bid Item #2 – Terminal Tank Site Sitework. If not, what Bid Item does the price for the fencing and gates belong in?	See Section 01220, Bid Item 2 which includes fencing.
106	In Addendum #2, in the Supplementary Conditions it lists the required insurance for the project, but does not list any Pollution Liability Insurance like in the original Supplementary Conditions before Addendum #2 was released. Most subcontractors do not typically carry Pollution Liability Insurance and it is expensive to purchase. Is the subcontractor doing the fence and gate scope of work required to have Pollution Liability Insurance to work on this project?	Addendum 2 did not revise Section 00800: Supplementary Conditions.
107	Would it be possible to extend the bid date by a week or 2 to give us more time to putt our bid package together. A lot of the suppliers are short on materials and it is holding up their pricing. Any additional time would be helpful and appreciated.	The bid date will remain July 15, 2021.
108	Hand holes, on the site drawings there are items labeled HH-1, HH-2, HH-3, HH-4, HH-5, there is only one hand hole detail and it shows a 48"x48"x48" vault. Are these all the same?	See Addendum 3, Drawing 00TE05 for clarification on handhole sizes.
109	Equipment List, is there a complete equipment list for this project? For example on drawing 40E02 there are some items noted with an astresk labeled PIT-1105*, PIT-1104*, is there a list with all the pieces of equipment?	The Contractor is responsible for equipment takeoffs.
110	I need see if you can confirm whether or not the bidding contractor's has to carry the \$1,000,000 dollars in our base bid for the owner furnished pumps, motors, & VFD's per addendum 2 spec section 01640?	Per Addendum 2, Section 01640, Contractor shall include costs to administer, install owner-furnished equipment in the base bid and all other associate costs required for a complete and in place installation not included Appendix I. Assignment of the owner-furnished equipment will be through a Change Order per Section 00700 and Section 00800 and include the pre-procurement purchase package costs that have not already been paid to the Supplier at the time of assignment.
111	Looking through the specifications for the door hardware (08710), hardware set 1 and 2 or missing from the Hardware Groups section. Can you provide those to me?	See Addendum 3, Section 08710 for clarification.
112	On Page 13207-6 2. a. 1) says Ten domed Tanks Conflict 5 or 10? 2. a. 3) says Five domed Tanks Same page 2. b. Only DN has in its employ shotcrete Forman, shotcrete nozzleman and prestressing foremen (That is in DN Tanks scope of work)	See Addendum 3, Section 13207 for clarification.