NOTICE TO BIDDERS, BID, CONTRACT,
GENERAL CONDITIONS AND SPECIFICATIONS

For

LA GRANADA PUMP STATION

CI 8082
Specification No.: 2018/2019-25
January 2020

Jay T. Spurgin, PE - Public Works Director
Clifford G. Finley, PE - City Engineer
Nader Heydari, PE, CCM - Division Manager
City Project No.: Cl 8082
The Specifications contained herein have been prepared by, or under the direct supervision of, the following Registered Professional Engineer:

[Signature]
A.M. Shah

REGISTERED CIVIL ENGINEER
AMAR SHAH

[Signature]

REGISTERED ELECTRICAL ENGINEER
CEZAR ROSU

APPROVED PER T.O.M.C. 3-10.303 or as directed by City Council

[Signature]
CLIFFORD G. FINLEY, PE - CITY ENGINEER
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<th>Code</th>
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<td>Precast Concrete Utility and Drain Structures</td>
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<td>16 50 00</td>
<td>480/277 Volt Switchboard</td>
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16 60 00 – Motor Control Center
16 70 00 – Grounding
16 70 50 – Standby Diesel Engine Power Generator Set – 480 VAC
16 80 00 – Automatic Transfer Switches
16 90 00 – Control Cabinet and Controls
16 95 00 – Modifications to Existing Electrical Components
16 96 00 – Electrical System Testing
16 96 10 – Short-Circuit Fault Current, Protective Device Coordination, and Arc Flash Studies
17 40 00 – Field Instrumentation
17 41 00 – Control Loop Descriptions
17 50 00 – SCADA System

APPENDICES

Appendix A – Record Drawings of Existing Facilities (Record Drawings are for reference only and the City is not responsible for their accuracy)

Appendix B – City Water Standards

Appendix C – City Road Design and Standards

Appendix D – Project Identification Sign

Appendix E – Sample Loop Drawing
NOTICE INVITING BIDS

LA GRANADA PUMP STATION-CI 8082
SPECIFICATION NO: 2018/2019-25

The City of Thousand Oaks ("City") will receive sealed bids for the La Granada Pump Station project at the office of the City Clerk no later than **Wednesday, March 11, 2020 at 3:30 PM**, at which time or thereafter bids will be opened and read aloud. Bids received after this time will be returned unopened. Bids shall be valid for sixty (60) calendar days after the bid opening date. Bids must be submitted on the City’s Bid Forms.

The work consists of furnishing all labor, materials, tools, equipment, and incidentals as required by the plans (Drawing Number:15-04A, Sheets 1 through 89), Specifications, and Contract Documents. The general items of work include demolition and modifications of existing components, construction of new pump station, construction of new diesel-powered standby generator at the pump station site, and construction of new water pipelines. The project entails civil, electrical, mechanical, structural, instrumentation, control and SCADA works.

The new pump station and standby generator shall be constructed at the existing La Granada Reservoir site (510 North Conejo School Road, Thousand Oaks, CA) near Mountain Crest Circle cul-de-sac. Construction includes installation of two 480VAC 50HP pumps, one 480VAC 300HP fire pump, 6 inches through 24 inches steel piping, approximately 850 feet of 18-inch welded steel pump discharge pipe (along the reservoir’s access road and approximately 10-foot wide City-owned equestrian trail), 14-inch reservoir inlet/outlet pipeline assembly modifications, isolation and control valves, surge tank, Southern California Edison service line and transformer, electrical switchboard, MCC, ATS, control cabinet, lighting, instruments, controls, electrical and communication conduits, communication system, SCADA (Supervisory Control and Data Acquisition) system, masonry building, air compressor, air piping, concrete curb and gutter, asphalt and concrete paving, replacement of existing chain link fence and gates, and miscellaneous civil, concrete, masonry, and metal work.

The new water distribution pipeline shall be constructed along La Granada Drive between Erbes Road and Hood Drive in the City of Thousand Oaks. Construction includes installation of approximately 2,800 feet of below ground 10-inch PVC pipeline, fittings, valves, pipe appurtenances, connections to existing pipelines, fire hydrants, air-vac valves, blow-off assembly, and associated work.
Bidders are encouraged to electronically register with the City prior to downloading the Contract Documents. Registration shall be done at the following web address: https://www.ebidexchange.com/toaks

When registering, use the Commodity Code(s): 930-195, 930-125, 930-025, 912-065, 912-085, 962-080, 912-050, 995-025, 995-105. Prospective bidders may view summary information about solicitations but must be registered at this site and logged in to download the Contract Documents. Prospective bidders may also view the plan holders list by going to the solicitations tab, selecting view, and clicking on the bidders tab. The Contract Documents may be downloaded at no charge. Registration information will be used to notify prospective bidders via e-mail of addenda to the Contract Documents and will be the sole means of providing such notification.

ONLY ELECTRONICALLY REGISTERED BIDDERS WILL RECEIVE ADDENDA TO THE CONTRACT DOCUMENTS. BIDDERS SHALL NOT BE RELIEVED OF BIDS DUE TO THE FAILURE TO REGISTER OR RECEIVE ADDENDA. BIDDERS ASSUME ALL RISKS OF SUBMITTING BIDS WITHOUT REGISTERING, INCLUDING BUT NOT LIMITED TO THE RISK OF FORFEITURE OF THE BID SECURITY AND THE RISK THAT THE BID WILL BE DEEMED NON-RESPONSIVE.

Bid and Contract Documents may be downloaded free of charge at https://www.ebidexchange.com/toaks.

To the extent required by Section 20103.7 of the Public Contract Code, upon request, the City shall provide an electronic copy of the Contract Documents at no charge to a contractor plan room service. Prospective bidders who obtain a copy from the City, through a plan room, or by other means, must still electronically register with the City in order to receive any addenda to the Bid or Contract Documents.

Bids must be accompanied by a Bid Bond on the form included in the Contract Documents, cash, or a certified or cashier's check in an amount not less than ten percent (10%) of the submitted Total Bid Price.

A Pre-Bid Site Walk will be held at the existing La Granada Reservoir site at the end of Mountain Crest Circle cul-de-sac(reservoir access Road is located next to the private property of 2352 Mountain Crest Circle, Thousand Oaks, CA 91362) on the following date and time: Thursday, February 20, 2020 at 10:30 AM. Prospective bidders MAY NOT visit the site and enter the City property on their own. The Pre-Bid Site Walk is NOT mandatory; however, bidders' attendance is highly recommended.

The successful bidder will be required to furnish the City with requisite insurance and Payment and Performance Bonds on the forms included in the contract documents equal to 100% of the Contract Price.
Pursuant to Public Contract Code Section 22300, the successful bidder may substitute certain securities for funds withheld by City to ensure its performance under the Contract.

Pursuant to Section 1770, et seq. of the California Labor Code, the Contractor and all subcontractors shall pay not less than the prevailing rate of per diem wages as determined by the Director of the California Department of Industrial Relations and comply with all applicable Labor Code provisions, which include, but are not limited to the employment of apprentices, the hours of labor and the debarment of contractors and subcontractors.

Pursuant to Labor Code sections 1725.5 and 1771.1, all contractors and subcontractors that wish to bid on, be listed in a bid proposal, or enter into a contract to perform public work must be registered with the Department of Industrial Relations. No bid will be accepted, nor any contract entered into without proof of the bidder’s and subcontractors’ current registration with the Department of Industrial Relations. Within five working days of the bid opening, the bidder shall submit a valid DIR number. Failure to do so will deem the bid non-responsive. This Project will be subject to compliance monitoring and enforcement by the Department of Industrial Relations. If awarded a Contract, the Bidder and its subcontractors of every tier shall maintain active registration with the Department of Industrial Relations for the duration of the Project. It shall be the Bidder’s sole responsibility to evaluate and include the cost of complying with all labor compliance requirements.

Each bidder shall be a licensed contractor pursuant to the California Business and Professions Code and shall be licensed in the following classification(s) of contractor’s license(s), throughout the duration of the Contract: Class A License. All Electrical work must be performed by an electrical contractor holding a valid C-10 license.

The successful bidder will be required to complete all work within 365 calendar days from the commencement date stated in the Notice to Proceed. There are intermediate completion milestones that contractor is required to comply with according to the contract documents (See “Summary of Work” Section 01 11 00, Sub-Section 1.15 Allowable Schedule of Work Items).

In accordance with Government Code section 53069.85, City will be compensated for damages incurred due to delays for which the Contractor is responsible. The parties agree that determining City’s exact delay damages is and will continue to be impracticable and extremely difficult. As such, for each calendar day in excess of the time agreed upon for completion of the work, that is 365 calendar days for the overall project, and also the intermediate completion milestones (as specified in “Summary of Work” Section 01 11 00, Sub-Section 1.15 Allowable Schedule of Work Items), the Contractor shall pay to the City $1500 per day, as liquidated damages and not as a penalty or forfeiture. Such amount shall constitute the only payment allowed for damages resulting from Contractor
caused delays. The City shall have the right to deduct the amount of liquidated damages from any money due or that may become due under the Contract.

Consistent with Public Contract Code Section 7102, Contractor will be compensated for damages incurred due to delays for which the City is responsible. The parties agree that determining Contractor’s exact delay damages is and will continue to be impracticable and extremely difficult. As such, for each calendar day in excess of the time agreed upon “365 calendar days” for completion of the work, the City shall pay to the Contractor $1500 per day, as reverse liquidated damages and not as a penalty or forfeiture. Such amount shall constitute the only payment allowed for any City caused delays and shall necessarily include all overhead, all profits, all administrative costs, all bond costs, all labor, materials, equipment and rental costs and any other costs, expenses and fees incurred or sustained as a result of such delays. Notice of requests for delay damages and additional days shall be provided to the City within seven (7) days from the discovery of the circumstances giving rise to any delay or three (3) days from the discovery of any latent or subsurface conditions giving rise to contract time extensions.

The calendar days specified above includes the City Holiday Closures, as well as all legal holidays. Construction work is only authorized within the dates and times as listed in Section 01 11 00 Summary of Work. Bidders shall also note that City Hall is closed every other Friday, but inspection is available on those alternating Friday Closures. However, no inspection will be available on all holidays and weekends.

Award of Contract: The City shall award the Contract for the Work to the lowest responsive, responsible bidder as determined from the BASE BID ALONE by the City. The City reserves the right to reject any or all bids or to waive any irregularities or informalities in any bids or in the bidding process.

For further information, contact Chandani Gunasekara, City of Thousand Oaks at (805) 449-2461 or cgunasekara@toaks.org.

BY ORDER OF THE CITY OF THOUSAND OAKS

DATED THIS January 31,2020

[Signature]
Cynthia M. Rodriguez, City Clerk

Publish: February 6,2020
INSTRUCTIONS TO BIDDERS

1. AVAILABILITY OF CONTRACT DOCUMENTS

Bids must be submitted to the City on the Bid Forms which are a part of the Bid Package for the Work. Contract Documents may be downloaded or obtained from the City at the location(s) and at the time(s) indicated in the Notice Inviting Bids. Any charge for the Contract Documents is stated in the Notice Inviting Bids. If requested, the City shall also make the Contract Documents available for review in electronic form at one or more plan rooms at no charge, as required by Public Contract Code section 20103.7.

In order to receive addenda, all bidders must register with the City in the manner stated in the Notice Inviting Bids. Prospective bidders who obtain a copy of the Contract Documents through a plan room or other means will still be required to register with the City to receive addenda.

2. EXAMINATION OF CONTRACT DOCUMENTS

Bidders shall be solely responsible for examining the Site and the Contract Documents, including any addenda issued during the bidding period, and for informing themselves with respect to local labor availability, means of transportation, necessity for security, laws and codes, local permit requirements, wage scales, local tax structure, contractors’ licensing requirements, availability of required insurance, and other factors that could affect the Work. Bidders are responsible for consulting the standards referenced in the Contract Documents. Failure of Bidder to so examine and inform itself shall be at its sole risk, and no relief for error or omission will be given except as required under State law.

3. INTERPRETATION OF CONTRACT DOCUMENTS

Discrepancies in, and/or omissions from the Plans, Specifications or other Contract Documents or questions as to their meaning shall be immediately brought to the attention of the City by submission of a written request for an interpretation or correction to the City. Such submission, if any, must be sent to the City’s Project Manager, Chandani Gunasekara by emailing to cgunasekara@toaks.org. All questions must be received at least 7 calendar days prior to bid opening and not later than 5:00pm on the last day.

Any interpretation of the Contract Documents will be made only by written addenda duly issued and delivered to each person or firm who has obtained a set of Contract Documents and is registered with the City. The City will not be responsible for any
explanations or interpretations provided in any other manner. No person is authorized to make any oral interpretation or modification of any provision in the Contract Documents to any bidder, and no bidder should rely on any such oral interpretation or modification.

Bids shall include complete compensation for all items that are noted in the Contract Documents as the responsibility of the Contractor.

4. **INSPECTION OF SITE; PRE-BID CONFERENCE AND SITE WALK**

Each prospective bidder is responsible for fully acquainting itself with the conditions of the Site (which may include more than one site as identified in the notice inviting bids), as well as those relating to the construction and labor of the Work, to fully understand the facilities, difficulties and restrictions which may impact the cost or effort required to complete the Work. If a Pre-Bid Conference is required by the Notice Inviting Bids, a Pre-Bid Conference and Site Walk will be held on the date(s) and time(s) indicated in the Notice Inviting Bids.

Storm, surface, nuisance, or other waters may be encountered at various times during construction of the Project. Federal and State laws require the City and its contractors to appropriately manage such waters pursuant to the requirements of California State Water Resources Control Board Order Number 2009-0009-DWQ (NPDES Permit No. CAS000002), as amended by Order Numbers 2010-0014-DWQ, 2012-0006-DWQ, and any subsequent amendment to or renewal thereof, State Water Resources Control Board Order No. 2013-0001-DWQ (NPDES Order No. CAS000004), Los Angeles Regional Water Quality Control Board Order No. R4-2012-0077, the Federal Clean Water Act, and the California Porter Cologne Water Quality Control Act. By submitting a Bid, each bidder acknowledges that it has investigated the risk arising from such waters, has prepared its Bid accordingly, and assumes any and all risks and liabilities arising therefrom, and shall comply with all permits, orders, and all other requirements imposed by law.

5. **ADDENDA**

The City reserves the right to revise the Contract Documents prior to the bid opening date. Revisions, if any, shall be made by written addenda. All addenda issued by the City shall be included in the bid and made part of the Contract Documents. Pursuant to Public Contract Code Section 4104.5, if the City issues an Addendum which includes material changes to the Work less than 72 hours prior to the deadline for submission of bids, the City will extend the deadline for submission of bids. The City may determine, in its sole discretion, whether an Addendum warrants postponement of the bid submission date. If required by the Notice Inviting Bids, each prospective bidder shall register with the City at the following web address: https://www.ebidexchange.com/toaks. Copies of addenda will only be furnished by e-mail to the e-mail address used to register. Please Note: Bidders are responsible for...
ensuring that they have received any and all addenda. To this end, each bidder should contact the City’s Project Manager, Chandani Gunasekara to verify that she has received all addenda issued, if any, prior to the bid opening. Failure to acknowledge receipt of all addenda may result in bid rejection.

6. **ALTERNATE BIDS**

If alternate bid items are called for in the Contract Documents, the lowest bid will be determined on the basis of the base bid only unless otherwise specified in the Notice. The time required for completion of the alternate bid items has been factored into the Contract Time and no additional time will be allowed for performing any of the alternate bid items, unless specifically noted in the alternate bid item. The City may elect to include one or more of the alternate bid items, or to otherwise remove certain Work from the scope of work. Accordingly, each Bidder must ensure that each bid item contains a proportionate share of profit, overhead and other costs or expenses which will be incurred by the Bidder.

7. **COMPLETION OF BID FORMS**

Bids shall only be prepared using copies of the Bid Forms which are included in the Contract Documents and are provided herein. The use of substitute bid forms other than clear and correct photocopies of those provided by the City will not be permitted. Bids shall be executed by an authorized signatory with the appropriate authority to bind the bidder as described in these Instructions to Bidders. In addition, Bidders shall fill in all blank spaces (including inserting “N/A” where applicable) and initial all interlineations, alterations, or erasures to the Bid Forms. Bidders shall neither delete, modify, nor supplement the printed matter on the Bid Forms nor make substitutions thereon. **USE OF BLACK OR BLUE INK, INDELIBLE PENCIL OR A TYPEWRITER IS REQUIRED.** Deviations in the bid form may result in the bid being deemed non-responsive.

8. **MODIFICATIONS OF BIDS**

Each Bidder shall submit its Bid in strict conformity with the requirements of the Contract Documents. Unauthorized additions, modifications, revisions, conditions, limitations, exclusions or provisions attached to a Bid may render it non-responsive and may cause its rejection. Bidders shall neither delete, modify, nor supplement the printed matter on the Bid Forms, nor make substitutions thereon. Oral, telephonic and electronic modifications will not be considered, unless the Notice Inviting Bids authorizes the submission of electronic bids and modifications thereto and such modifications are made in accordance with the Notice Inviting Bids.

9. **DESIGNATION OF SUBCONTRACTORS**

Pursuant to State law, the Bidders must designate the name and location of each subcontractor who will perform work or render services to the Bidder in an amount that

**INSTRUCTIONS TO BIDDERS**
exceeds one-half of one percent (1/2%) of the Bidder’s Total Bid Price, or if work involves streets or highways, including bridges, an amount that exceeds one-half of one percent (1/2%) or $10,000, whichever is greater, as well as the portion of work each such subcontractor will perform on the form provided herein by the City. No additional time will be provided to bidders to submit any of the requested information in the Designation of Subcontractor form.

10. LICENSING REQUIREMENTS

Pursuant to Section 7028.15 of the Business and Professions Code and Section 3300 of the Public Contract Code, all bidders must possess proper licenses for performance of this Contract. Subcontractors must possess the appropriate licenses for each specialty subcontracted. The City has determined that bidders must have a Class A license to be eligible for award of this Contract. Pursuant to Section 7028.5 of the Business and Professions Code, any bid submitted by a contractor not currently licensed in accordance with state law and pursuant to the requirements found in the Contract Documents shall be nonresponsive, and the City shall reject the Bid. The City shall have the right to request, and Bidders shall provide within five (5) calendar days, evidence satisfactory to the City of all valid license(s) currently held by that Bidder and each of the Bidder’s subcontractors, before awarding the Contract. Please also note that, pursuant to Public Contract Code Section 20676, sellers of "mined material" must be on an approved list of sellers published pursuant to Public Resources Code Section 2717(b) in order to supply mined material for this Contract.

11. SIGNING OF BIDS

All Bids submitted shall be executed by the Bidder or its authorized representative. Bidders may be asked to provide evidence in the form of an authenticated resolution of its Board of Directors or a Power of Attorney evidencing the capacity of the person signing the Bid to bind the Bidder to each Bid and to any Contract.

If a Bidder is a joint venture or partnership, it may be asked to submit an authenticated Power of Attorney executed by each joint venturer or partner appointing and designating one of the joint venturers or partners as a management sponsor to execute the Bid on behalf of Bidder. Only that joint venturer or partner shall execute the Bid. The Power of Attorney shall also: (1) authorize that particular joint venturer or partner to act for and bind Bidder in all matters relating to the Bid; and (2) provide that each venturer or partner shall be jointly and severally liable for any and all of the duties and obligations of Bidder assumed under the Bid and under any Contract arising therefrom. The Bid shall be executed by the designated joint venturer or partner on behalf of the joint venture or partnership in its legal name.
12. **BID SECURITY**

Each bid shall be accompanied by: (a) a bid bond, in the form attached, payable to the City executed by the bidder as principal and surety as obligor; (b) a certified check made payable to the City; (c) a cashier's check made payable to the City; or (d) cash, in an amount not less than 10% of the maximum amount of the bid. Personal sureties and unregistered surety companies are unacceptable. The surety insurer shall be admitted to transact surety business in the State of California, as defined in Code of Civil Procedure Section 995.120. The cash, check or bid bond shall be given as a guarantee that the bidder shall execute the Contract if it be awarded to the bidder, shall provide the required payment and performance bonds and insurance certificates and endorsements as within ten (10) calendar days after notification of the award of the Contract to the bidder. Failure to provide the required documents may result in forfeiture of the full penal sum of bidder's bid deposit or bond to the City and the City may award the Contract to the next lowest responsive, responsible bidder, or may call for new bids.

13. **SUBMISSION OF SEALED BIDS**

Once the Bid and supporting documents have been completed and signed as set forth herein, they shall be placed, along with the Bid Security and other required materials in an envelope, sealed, addressed and delivered or mailed, postage prepaid to the City at the place and to the attention of the person indicated in the Notice Inviting Bids. No oral or telephonic bids will be considered. No forms transmitted via the internet, e-mail, facsimile, or any other electronic means will be considered unless specifically authorized by City as stated in the Notice. The envelope shall also contain the following in the lower left-hand corner thereof:

Bid of (Bidder's Name)
for the CI 8082 La Granada Pump Station Project

Only where expressly permitted in the Notice Inviting Bids may Bidders submit their bids via electronic transmission pursuant to Public Contract Code Sections 1600 and 1601. The acceptable method(s) of electronic transmission shall be stated in the Notice Inviting Bids. City reserves the right to not accept electronically transmitted bids where not specifically authorized in the Notice Inviting Bids, and may reject any bid not strictly complying with City's designated methods for delivery.

14. **DELIVERY AND OPENING OF BIDS**

Bids will be received by the City at the address shown in the Notice Inviting Bids up to the date and time shown therein. The City will leave unopened any Bid received after the specified date and time, and any such unopened Bid will be returned to the Bidder. It is the Bidder's sole responsibility to ensure that its Bid is received as specified. Bids may be submitted earlier than the dates(s) and time(s) indicated.

INSTRUCTIONS TO BIDDERS
Bids will be opened at the date and time stated in the Notice Inviting Bids, and the amount of each Bid will be read aloud and recorded. All Bidders may, if they desire, attend the opening of Bids. The City may in its sole discretion, elect to postpone the opening of the submitted Bids. City reserves the right to reject any or all Bids and to waive any informality or irregularity in any Bid. In the event of a discrepancy between the written amount of the Bid Price and the numerical amount of the Bid Price, the written amount shall govern.

15. WITHDRAWAL OF BID

Prior to the original time set for bid opening, a Bid may be withdrawn by the Bidder only by means of a written request signed by the Bidder or its properly authorized representative. Any request to withdraw a bid after bid opening must be made in accordance with Public Contract Code section 5100 et seq. and must be submitted in writing within five (5) working days, excluding Saturdays, Sundays and State holidays, specifying in detail how the mistake was made.

16. BASIS OF AWARD; BALANCED BIDS

The City shall award the Contract to the lowest, responsible Bidder that submits a responsive Bid. The City may reject any Bid which, in its opinion when compared to other bids received or to the City’s internal estimates, does not accurately reflect the cost to perform the Work. The City may reject as non-responsive any bid which unevenly weights or allocates costs, including but not limited to overhead and profit, to one or more particular bid items.

17. DISQUALIFICATION OF BIDDERS; INTEREST IN MORE THAN ONE BID

No bidder shall be allowed to make, submit or be interested in more than one bid. However, a person, firm, corporation or other entity that has submitted a proposal to a bidder, or that has quoted prices of materials to a bidder, is not thereby disqualified from submitting a proposal or quoting prices to other bidders submitting a bid to the City, nor shall such entity be disqualified if it is listed as a subcontractor on more than one bid submitted. No person, firm, corporation, or other entity may submit a proposal to a bidder, or quote prices of materials to a bidder, when also submitting a prime bid for the Work.

18. INSURANCE REQUIREMENTS

The successful bidder shall procure and maintain insurance in the form and in the amount specified in the Contract Documents.

INSTRUCTIONS TO BIDDERS
19. **AWARD PROCESS**

Once all Bids are opened and reviewed to determine the lowest responsive and responsible Bidder, the City Council or designee may award the contract. The apparent successful Bidder should begin to prepare the following documents: (1) the Performance Bond; (2) the Payment (Labor and Materials) Bond; (3) the required insurance certificates and endorsements; and (4) an Initial Critical Path Method schedule in accordance with Article 6 of the General Conditions. Once the City notifies the Bidder of the award, the Bidder will have ten (10) calendar days from the date of the award to execute the Contract and supply the City with an executed contract and all of the required bonds, evidence of insurance and other materials.

20. **BID PROTEST PROCEDURE**

Submitted bids will be timely made available for review upon written request of any Bidder. Any interested party may file a protest of a Bid in accordance with the following procedure:

A. The City will notify all bidders of an intended award or an intent to reject the bidder's bid.

B. All protests must be filed in writing with the PUBLIC WORKS DEPARTMENT DIRECTOR within five 5 business days of the date on the notice of intended award or the notice of intent to reject.

C. All protests shall be in writing, state the grounds for the protest, state the facts relevant to the protest, and all evidentiary support to rebut adverse evidence that it or another bidder was either non-responsive or not responsible.

D. The City Manager or designee shall review the protest and issue a written decision on the protest. The City Manager or designee may base the decision on the written protest alone or may informally gather evidence. If the protested bid has a value of One Hundred Seventy-Five Thousand and no/100 Dollars ($175,000) or less the City Manager’s or designee’s decision shall be final.

E. If a bid is rejected on the grounds that the bidder is not a responsible bidder, the bidder may submit a protest. A hearing will be set within a reasonable time to provide a decision before final approval of the selected low bid. If the protested bid has a value of One Hundred Seventy-Five Thousand and no/100 Dollars ($175,000) or less the City Manager’s or designee’s decision shall be final.
F. If the protested bid has a value exceeding One Hundred Seventy-Five Thousand and no/100 Dollars ($175,000) an appeal of the City Manager’s decision may be filed with the City Council. All such appeals must be in writing and shall be filed with the City Clerk within five 5 business days from the date of the City Manager’s decision.

The procedure and time limits set forth in this paragraph are mandatory and are the sole and exclusive remedy in the event of Bid protest. Failure to comply with these procedures shall constitute a waiver of any right to further pursue the bid protest, including filing a Government Code Claim or legal proceedings.

21. **WORKERS COMPENSATION**

Each bidder shall submit the Contractor’s Certificate Regarding Workers’ Compensation form.

22. **RETENTION AND SUBSTITUTION OF SECURITY**

The Contract Documents call for monthly progress payments based upon the percentage of the work completed. Unless otherwise specified in the Notice Inviting Bids, the City will retain five percent (5%) of each progress payment as provided by the Contract Documents. At the request and expense of the successful Bidder, the Contractor may substitute securities for the amount so retained in accordance with Public Contract Code Section 22300.

23. **PREVAILING WAGES**

The City has obtained from the Director of the Department of Industrial Relations the general prevailing rate of per diem wages in the locality in which this work is to be performed for each craft or type of worker needed to execute the Contract. These rates are on file and available at City Hall or may be obtained online at http://www.dir.ca.gov/dlsr. Bidders are advised that a copy of these rates must be posted by the successful Bidder at the job site(s).

Pursuant to Labor Code sections 1725.5 and 1771.1, all contractors and subcontractors that wish to bid on, be listed in a bid proposal, or enter into a contract to perform public work must be registered with the Department of Industrial Relations. No bid will be accepted, nor any contract entered into without proof of the Bidder’s and its subcontractors’ current registration with the Department of Industrial Relations. Bidder shall sign and submit with its Bid the Public Works Contractor Registration Certification, attesting to the facts contained therein. Failure to submit this Certification with the Bid may render the Bid non-responsive. Each Bidder shall provide the registration number for each listed subcontractor in the space provided in the Designation of Subcontractors Form.

**INSTRUCTIONS TO BIDDERS**
In accordance with Labor Code section 1773.3, the City will provide notice of the award to the Department of Industrial Relations on the Form PWC-100. The Bidder who is awarded the Contract shall submit to the City any information requested by the City to complete the form, including but not limited to identification of the worker classifications for the Bidder and all listed subcontractors, within 24 hours of the request. Failure or refusal to provide the requested information prior to execution of the Contract may result in forfeiture of the Bidder’s Bid deposit or bond to the City, and the City may award the Contract to the next lowest responsive and responsible Bidder, or may call for new Bids.

24. DEBARMENT OF CONTRACTORS AND SUBCONTRACTORS

In accordance with the provisions of the Labor Code, contractors or subcontractors may not perform work on a public works project with a subcontractor who is ineligible to perform work on a public project pursuant to Section 1777.1 or Section 1777.7 of the Labor Code. Any contract on a public works project entered into between a contractor and a debarred subcontractor is void as a matter of law. A debarred subcontractor may not receive any public money for performing work as a subcontractor on a public works contract. Any public money that is paid to a debarred subcontractor by the Contractor shall be returned to the City. The Contractor shall be responsible for the payment of wages to workers of a debarred subcontractor used on the Work.

25. IRAN CONTRACTING ACT CERTIFICATION

Each bidder shall submit the certification required by the Iran Contracting Act of 2010, Public Contract Code section 2200 et seq. included in the Bid Documents.

26. PERFORMANCE BOND AND PAYMENT (LABOR AND MATERIALS) BOND REQUIREMENTS

Within the time specified in the Contract Documents, the successful bidder shall deliver to the City two identical counterparts of the Performance Bond and Payment (Labor and Materials) Bond in the form supplied by the City and included in the Contract Documents. Failure to do so may, in the sole discretion of City, result in the forfeiture of the Bid Security. The surety supplying the bond must be an admitted surety insurer, as defined in Code of Civil Procedure Section 995.120, authorized to do business in the State of California and satisfactory to the City. The Performance Bond and the Payment (Labor and Materials) Bond shall be for one hundred percent (100%) of the Total Bid Price.

27. REQUEST FOR SUBSTITUTIONS

The successful bidder shall comply with the substitution request procedures set forth in the Contract Documents.
28. **SALES AND OTHER APPLICABLE TAXES, PERMITS, LICENSES AND FEES**

Contractor and its subcontractors performing work under this Contract will be required to pay California sales tax and other applicable taxes, and to pay for permits, licenses and fees required by the agencies with authority in the jurisdiction in which the work will be located, unless otherwise expressly provided by the Contract Documents. Bidders shall include all applicable taxes and fees in their bid. Bidder shall procure a business tax certificate from the City and pay all applicable local business taxes as set forth in the Thousand Oaks Municipal Code.

29. **EXECUTION OF CONTRACT**

As required herein the successful bidder shall execute the Contract included with the bid documents in the amount determined in accordance with the Contract Documents. The City may require appropriate evidence that the persons executing the Contract are duly authorized to do so on the Contractor’s behalf.

**END OF INSTRUCTIONS TO BIDDERS**
BIDDERS CHECKLIST

This checklist has been prepared and furnished to assist Bidders in including all items necessary for a complete Bid. Omission of items from the list does not relieve the Bidders of the obligation to comply with all requirements of the bid documents. Bidders' submittals should include, but are not necessarily limited to, the following:

<table>
<thead>
<tr>
<th>Item</th>
<th>Checked</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bidders Checklist Sheet (this sheet)</td>
<td>______</td>
</tr>
<tr>
<td>2. Bid</td>
<td>______</td>
</tr>
<tr>
<td>3. Contractor’s Certificate regarding Workers’ Compensation</td>
<td>______</td>
</tr>
<tr>
<td>4. Bid Bond or other security</td>
<td>______</td>
</tr>
<tr>
<td>5. List of Subcontractors Information</td>
<td>______</td>
</tr>
<tr>
<td>6. Information Required of Bidders</td>
<td>______</td>
</tr>
<tr>
<td>7. Non-Collusion Declaration</td>
<td>______</td>
</tr>
<tr>
<td>8. Iran Contracting Act Certification</td>
<td>______</td>
</tr>
<tr>
<td>9. Public Works Contractor Registration Certification</td>
<td>______</td>
</tr>
</tbody>
</table>

Bidder acknowledges and understands that, pursuant to Public Contract Code Section 20676, sellers of "mined material" must be on an approved list of sellers published pursuant to Public Resources Code Section 2717(b) in order to supply mined material for this Contract.

I hereby certify under penalty of perjury under the laws of the State of California that all of the information submitted in connection with this Bid and all of the representations made herein are true and correct.

Name of Bidder ________________________________

Signature ________________________________

Name and Title ________________________________

Dated ________________________________
NAME OF BIDDER: ____________________________________________________________

The undersigned Bidder hereby declares that we have carefully examined the location of the proposed Work, and have read and examined the Contract Documents, including all plans, specifications, and all addenda, if any, for the following Work:

LA GRANADA PUMP STATION
CITY PROJECT NO. CI 8082

We hereby propose to furnish all labor, materials, equipment, tools, transportation, and services, and to discharge all duties and obligations necessary and required to perform and complete the Work in strict accordance with the Contract Documents for the Bid Price shown on the following Bid Schedules:

**BID SCHEDULE A**
PROJECT MOBILIZATION/SIGNAGE

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>ITEM DESCRIPTION</th>
<th>UNIT OF MEASURE</th>
<th>EST. QTY</th>
<th>UNIT PRICE</th>
<th>ITEM COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization</td>
<td>LS</td>
<td>1</td>
<td>$185,000.00</td>
<td>$185,000.00</td>
</tr>
<tr>
<td>2</td>
<td>Project Signs &amp; Trail Delineation Work</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL BID PRICE FOR SCHEDULE A**

In Numbers: ____________________________

In Words: ____________________________________________

**BID SCHEDULE B**
10-INCH WATER PIPELINE ALONG LA GRANADA DRIVE

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>ITEM DESCRIPTION</th>
<th>UNIT OF MEASURE</th>
<th>EST. QTY</th>
<th>UNIT PRICE</th>
<th>ITEM COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Erosion &amp; Pollution Control BMP’S</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Utility Potholing</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Traffic Control</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### BID SCHEDULE B

**10-INCH WATER PIPELINE ALONG LA GRANADA DRIVE**

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>ITEM DESCRIPTION</th>
<th>UNIT OF MEASURE</th>
<th>EST. QTY.</th>
<th>UNIT PRICE</th>
<th>ITEM COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Construction and Demolition Waste Management</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Sheeting, Shoring, and Bracing or Equivalent Method</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>10-Inch Water Pipeline</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Connections to Existing Pipelines</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Blow-off Assemblies</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Air Vacuum and Air Release Valves (AVARVs) Assemblies</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Fire Hydrant Assemblies</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Pavement Repair</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Pipeline Cleaning, Disinfection, and Testing</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Rock Excavation and Removal</td>
<td>TON</td>
<td>650</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Work Closeout – Bid Schedule “B”</td>
<td>LS</td>
<td>1</td>
<td>$10,000.00</td>
<td>$10,000.00</td>
</tr>
</tbody>
</table>

**TOTAL BID PRICE FOR SCHEDULE B**

**In Numbers:**

**In Words:**

### BID SCHEDULE C

**EXISTING 14-INCH RESERVOIR INLET-OUTLET MODIFICATIONS, 18-INCH DISCHARGE PIPELINE, AND SCE FACILITIES**

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>ITEM DESCRIPTION</th>
<th>UNIT OF MEASURE</th>
<th>EST. QTY.</th>
<th>UNIT PRICE</th>
<th>ITEM COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Erosion &amp; Pollution Control BMP’S</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Utility Potholing</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Traffic Control</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## BID SCHEDULE C

**EXISTING 14-INCH RESERVOIR INLET-OUTLET MODIFICATIONS, 18-INCH DISCHARGE PIPELINE, AND SCE FACILITIES**

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>ITEM DESCRIPTION</th>
<th>UNIT OF MEASURE</th>
<th>EST. QTY.</th>
<th>UNIT PRICE</th>
<th>ITEM COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Construction and Demolition Waste Management</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Sheeting, Shoring, and Bracing or Equivalent Method</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>14-Inch Reservoir Inlet-Outlet Modifications</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>18-inch Discharge pipeline</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Blow-off Assemblies</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Air Vacuum and Air Release Valves (AVARVs) Assemblies</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Pipeline Cleaning, Disinfection, and Testing</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Rock Excavation and Removal</td>
<td>TON</td>
<td>400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Remove Existing Abandoned 14-Inch Pipe</td>
<td>LF</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Remove Existing Abandoned 6-Inch and Smaller Pipelines and Conduits</td>
<td>LF</td>
<td>250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>SCE Conduits</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>SCE Transformer Facility</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Removal of Existing SCE Facility and Service Wires</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Pavement Repair &amp; Slurry Seal in Public Streets</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Work Closeout – Bid Schedule “C”</td>
<td>LS</td>
<td>1</td>
<td>$10,000.00</td>
<td>$10,000.00</td>
</tr>
</tbody>
</table>

**TOTAL BID PRICE FOR SCHEDULE C**

In Numbers:

$10,000.00

In Words:

**$10,000.00**
### BID SCHEDULE D
**LA GRANADA PUMP STATION AND STANDBY GENERATOR**

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>ITEM DESCRIPTION</th>
<th>UNIT OF MEASURE</th>
<th>EST. QTY.</th>
<th>UNIT PRICE</th>
<th>ITEM COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Erosion &amp; Pollution Control BMP’S</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Utility Potholing</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Construction and Demolition Waste Management</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Sheeting, Shoring, and Bracing or Equivalent Method</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>La Granada Pump Station and Standby Generator Facilities</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Rock Excavation and Removal</td>
<td>TON</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Work Closeout– Bid Schedule “D”</td>
<td>LS</td>
<td>1</td>
<td>$15,000.00</td>
<td>$15,000.00</td>
</tr>
</tbody>
</table>

**TOTAL BID PRICE FOR SCHEDULE D**

In Numbers:

In Words:

### BID SCHEDULE E
**RESERVOIR ACCESS AND PERIMETER ROADS IMPROVEMENTS**

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>ITEM DESCRIPTION</th>
<th>UNIT OF MEASURE</th>
<th>EST. QTY.</th>
<th>UNIT PRICE</th>
<th>ITEM COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>Removal and Disposal of Existing Materials</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>Construction and Demolition Waste Management</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Fill and Aggregate Base Installation and Grading</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>New Concrete Curbs, Gutters, V-Ditches, and Cross Gutters</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>New Asphalt Concrete</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>New Concrete Pavement</td>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BID SCHEDULE E
RESERVOIR ACCESS AND PERIMETER ROADS IMPROVEMENTS

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>ITEM DESCRIPTION</th>
<th>UNIT OF MEASURE</th>
<th>EST. QTY.</th>
<th>UNIT PRICE</th>
<th>ITEM COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Work Closeout - Bid Schedule “E”</td>
<td>LS</td>
<td>1</td>
<td>$5,000.00</td>
<td>$5,000.00</td>
</tr>
</tbody>
</table>

TOTAL BID PRICE FOR SCHEDULE E

In Numbers: 

In Words: 

TOTAL BASE BID PRICE (SUM OF TOTAL BID PRICES FOR ALL SCHEDULES A THROUGH E)

In Numbers: 

In Words: 

Bidders must provide pricing for every bid item. If the City provides a bid item cost for “Mobilization,” Bidders shall incorporate that item cost into the bid without modification. If the cost for Mobilization if not listed in the bid items, the value for Mobilization shall not exceed the percentage listed in Article 40 of the General Conditions.

The estimated quantities for unit price items are for bidding purposes only and the City makes no representation that the actual quantities of work performed will not vary from the estimates.

In case of discrepancy between the unit price and the item cost set forth for a unit price item, the item cost, calculated at the unit price multiplied by the estimated quantity, shall prevail and shall be utilized as the basis for determining the lowest responsive, responsible bidder. However, if the amount set forth as a unit price is ambiguous, unintelligible or uncertain for any cause, or is omitted, or is the same amount as the entry in the “Item Cost” column, then the amount set forth in the “Item Cost” column for the item shall prevail and shall be divided by the estimated quantity for the item and the price thus obtained shall be the unit price. If any of the above discrepancies exist, the City may recalculate the bid price on the basis of the unit price and the bidder agrees to be bound by such recalculation. Final payment for unit price items shall be determined by the City from measured quantities of work actually performed.

In case of discrepancy between the written price and the numerical price, the written price shall prevail.
The total base bid price shall include all Work described in the Contract Documents. If no separate bid item is provided for any portion of the Work, the price thereof shall be considered to be included in the bid item that most closely applies to that portion of the Work.

The City reserves the right to reject any or all proposals and/or to clarify and negotiate unbalanced bid items.

The City reserves the right to delete any bid items.

The undersigned agrees that this Bid Form constitutes a firm offer to the City which cannot be withdrawn for the number of calendar days stated in the Notice Inviting Bids from the bid opening, or until a Contract for the Work is fully executed by the City and a third party, whichever is earlier.

____________________________________
Name of Bidder or Firm
The Contract Time shall commence on the date stated in the City’s Notice to Proceed. In no case shall the Contractor commence construction prior to the date stated in the City’s Notice to Proceed, or before providing the required bonds and evidence of insurance.

Bidder certifies that it is licensed in accordance with the California law providing for the registration of Contractors, License No. _________, Expiration Date _________, class of license _______. If the bidder is a joint venture, each member of the joint venture must include the above information.

The undersigned acknowledges receipt, understanding and full consideration of the following addenda to the Contract Documents.

Addenda No. _______________________
Addenda No. _______________________
Addenda No. _______________________
Addenda No. _______________________
Addenda No. _______________________  

__________________________________  
Name of Bidder or Firm
CONTRACTOR’S CERTIFICATE REGARDING
WORKERS’ COMPENSATION

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.

Name of Bidder ____________________________________________

Signature ________________________________________________

Name ________________________________________________

Title ________________________________________________

Dated _____________________________
KNOW ALL PERSONS BY THESE PRESENTS that, _________________
hereinafter called the PRINCIPAL, and ________________________ , a ____
corporation duly organized under the laws of the State of _______________________,
having its principal place of business at ______________________ in the State of
_____________________, hereinafter call the SURETY, are held and firmly bound unto the City of Thousand
Oaks, hereinafter called the OBLIGEE, on order, in the sum of
________________________________Dollars ($________ ________) (being at least
ten percent (10%) of the total amount of PRINCIPAL'S bid price) lawful money of the
United States, for the payment of which we bind ourselves, our heirs, executors,
administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION ARE SUCH THAT:

WHEREAS, the PRINCIPAL has submitted its Bid for the project entitled
______________________________ to the OBLIGEE, the Bid, by reference
thereto; being hereby made a part hereof.

NOW, THEREFORE, if the Bid is rejected or, in the alternate, if the Bid is accepted and
the PRINCIPAL signs and delivers a Contract and furnishes evidence of insurance and
a Performance Bond and Payment Bond, all in the form and within the time required by
the Contract Documents, then this obligation shall become null and void, otherwise the
same shall remain in full force and effect and upon default of the PRINCIPAL shall be
forfeited to the OBLIGEE, it being expressly understood and agreed that the liability of
the SURETY for any and all default of the PRINCIPAL shall be the entire amount of this
obligation as herein stated, as liquidated damages.

The SURETY, for value received, hereby agrees that the obligations of SURETY and its
bond shall not be impaired or affected by any extension of the time within which the
OBLIGEE may accept the Bid, and the SURETY hereby waives notice of any such
extension.
In the event suit is brought upon this bond by the OBLIGEE and judgment is recovered, the SURETY shall pay, in addition to the sum set forth above, all costs incurred by the OBLIGEE in such suit, including reasonable attorney's fees and expert witness fees, to be fixed by the court, in addition to the penal sum of the Bond.

Signed this ______ day of ________________, 20___

PRINCIPAL

BY ____________________________

SURETY

BY ____________________________

Note: Signature of person executing for SURETY must be notarized and evidence of corporate authority attached.

THE FOLLOWING INFORMATION IS REQUIRED

Any claims under this bond may be addressed to:

(Name and Address of Surety) __________________________________________

(Name and Address of Agent or Representative for service of process in California, if different from above)

(Telephone number of Surety and Agent or Representative for service of process in California)
ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of ___________________________)

On ________________________ before me, (insert name and title of the officer)

personally appeared ____________________________,

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _______________________________________ (Seal)

End of Section
DESIGNATION OF SUBCONTRACTORS

In compliance with the Subletting and Subcontracting Fair Practices Act of the Public Contract Code of the State of California, Sections 4100 et seq., each bidder shall set forth below: (a) the name and the location of the place of business and (b) the portion of the work which will be done by each subcontractor who will perform work or labor or render service to the Contractor in or about the construction of the work in an amount in excess of one-half of one percent (1/2%) of the Contractor’s Total Bid Price. Notwithstanding the foregoing, if the work involves streets and highways, then the Contractor shall list each subcontractor who will perform work or labor or render service to Contractor in or about the work in an amount in excess of one-half of one percent (1/2%) of the Contractor’s total Bid Price or $10,000, whichever is greater. No additional time shall be granted to provide the below requested information, unless permitted by law.

If no subcontractor is specified, for a portion of the work, or if more than one subcontractor is specified for the same portion of Work, then the Contractor shall be deemed to have agreed that it is fully qualified to perform that Work, and that it shall perform that portion itself.

The City requires the Contractor to perform at least 15% of the Work with its own forces and equipment.

<table>
<thead>
<tr>
<th>Work to be Performed</th>
<th>Subcontractor</th>
<th>Location of Business</th>
<th>% of the Work</th>
<th>License Number(s)</th>
<th>PWCR / DIR Registration Number</th>
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<tr>
<td>Work to be Performed</td>
<td>Subcontractor</td>
<td>Location of Business</td>
<td>% of the Work</td>
<td>License Number(s)</td>
<td>PWCR / DIR Registration Number</td>
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</table>

Name of Bidder ________________________________

Signature ________________________________

Name and Title ________________________________

Dated ________________________________
INFORMATION REQUIRED OF BIDDERS

A. INFORMATION ABOUT BIDDER

Failure to complete all information may render your bid non-responsive. [***Indicate not applicable ("N/A") where appropriate.***]

NOTE: Where Bidder is a joint venture, pages shall be duplicated and information provided for all parties to the joint venture.

1.0 Name of Bidder: _______________________________ __________________

2.0 Type of Entity: _______________________________ __________________

3.0 Bidder Address: ______________________________ __________________

___________________________________________________________

___________________________________________________________

___________________________________________________________

Facsimile Number       Telephone Number       E-Mail

4.0 How many years has Bidder’s organization been in business as a Contractor? ______________________________

5.0 How many years has Bidder’s organization been in business under its present name? ________________________

5.1 Under what other or former names has Bidder’s organization operated? _____________________________________________

6.0 If Bidder’s organization is a corporation, answer the following:

6.1 Date of Incorporation: ______________________________

6.2 State of Incorporation: ______________________________

6.3 President’s Name: ______________________________

6.4 Vice-President’s Name(s): ______________________________

6.5 Secretary’s Name: ______________________________

6.6 Treasurer’s Name: ______________________________
7.0 If an individual or a partnership, answer the following:

7.1 Date of Organization: ________________________________

7.2 Name and address of all partners (state whether general or limited partnership):

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

8.0 If other than a corporation or partnership, describe organization and name principals:

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

9.0 List other states in which Bidder's organization is legally qualified to do business.

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

10.0 What type of work does the Bidder normally perform with its own forces?

_________________________________________________________________
_________________________________________________________________

11.0 Has Bidder ever failed to complete any work awarded to it? If so, note when, where, and why:

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

12.0 Within the last five years, has any officer or partner of Bidder's organization ever been an officer or partner of another organization when
it failed to complete a contract? If so, attach a separate sheet of explanation:

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

13.0 Has Bidder ever filed a Government Code claim against a public agency? If so, explain the circumstances of the claim:

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

14.0 Has Bidder ever instituted litigation (including arbitration) against a public agency? If so, identify the public agencies involved, the case numbers, and the circumstances of the litigation:

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

15.0 Has a public agency ever instituted litigation (including arbitration) against Bidder? If so, identify the public agencies involved, the case numbers, and the circumstances of the litigation:

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

16.0 Have liquidated damages ever been assessed against the Bidder? If so, identify the agencies that assess liquidated damages against the Bidder:

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

17.0 Has a public agency ever filed a claim against the Bidder’s performance bond? If so, identify the agencies that filed a claim:

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________
18.0 Has the Bidder ever had a claim filed against the Bidder’s payment bond? If so, identify the project on which a claim was filed:

___________________________________________________________

___________________________________________________________

19.0 Has the Bidder ever had a claim filed against the Bidder’s bid bond or otherwise had to surrender its bid security? If so, identify the project:

___________________________________________________________

___________________________________________________________

20.0 List Trade References:

___________________________________________________________

___________________________________________________________

___________________________________________________________

___________________________________________________________

21.0 List Bank References (Bank and Branch Address):

___________________________________________________________

___________________________________________________________

___________________________________________________________

___________________________________________________________

22.0 Name of Bonding Company and Name and Address of Agent:

___________________________________________________________

___________________________________________________________
B. LIST OF CURRENT PROJECTS

[***Duplicate Page if needed for listing additional current projects.***]

<table>
<thead>
<tr>
<th>Project</th>
<th>Description of Bidder’s Work</th>
<th>Completion Date</th>
<th>Cost of Bidder’s Work</th>
<th>Contact Name &amp; Phone</th>
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INFORMATION REQUIRED OF BIDDERS
BID FORM 6
35
C. **LIST OF COMPLETED PROJECTS – LAST SEVEN YEARS**

Please include only those projects which are similar enough to the Work in scope and complexity to demonstrate Bidder’s ability to perform the required Work. The Bidder must specify at least the number of completed projects listed in all the categories shown in the table below. All projects shall be completed within the past 7 years. One completed project with multiple categories will be acceptable. Failure to meet or exceed this requirement may cause the bid to be rejected as non-responsive.

<table>
<thead>
<tr>
<th>Project Category</th>
<th>Minimum Number of Completed Projects in Past 7 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Construction of pump stations, including pertinent electrical and mechanical</td>
<td>One</td>
</tr>
<tr>
<td>work with individual pumps and motors with minimum 50 HP and maximum of 150HP</td>
<td></td>
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<tr>
<td>rating.</td>
<td></td>
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<tr>
<td>2. Construction of pump stations, including pertinent electrical and mechanical</td>
<td>One</td>
</tr>
<tr>
<td>work with individual pumps and motors 200 HP or larger.</td>
<td></td>
</tr>
<tr>
<td>3. Construction of 14-inch or larger welded steel pipe with minimum 150 psi</td>
<td>One</td>
</tr>
<tr>
<td>pressure class and extending for a length of at least 300 linear feet.</td>
<td></td>
</tr>
<tr>
<td>4. Construction of 8-inch or larger PVC pipe with minimum 150 psi pressure class</td>
<td>One</td>
</tr>
<tr>
<td>and extending for a length of at least 500 linear feet.</td>
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</tr>
</tbody>
</table>

Bidder shall provide Project Experience for each category. Add additional pages as required.
**Bidder’s Project Experience for Project Category 1 - Construction of pump stations, including pertinent electrical and mechanical work with individual pumps and motors with minimum 50 HP and maximum of 150HP rating.**

<table>
<thead>
<tr>
<th>Client Name and Address:</th>
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<tr>
<th>Client’s Contact Person Name &amp; Phone Number:</th>
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<thead>
<tr>
<th>Project Name and Description of Bidder’s Work:</th>
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<thead>
<tr>
<th>Pump and Motor Size and Description:</th>
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<tr>
<th>Period of Performance:</th>
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<tr>
<th>Cost of Bidder’s Work:</th>
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**Bidder’s Project Experience for Project Category 2 - Construction of pump stations, including pertinent electrical and mechanical work with individual pumps and motors 200 HP or larger.**

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<tr>
<th>Client Name and Address:</th>
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<th>Client’s Contact Person Name &amp; Phone Number:</th>
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<th>Project Name and Description of Bidder’s Work:</th>
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<th>Pump and Motor Size and Description:</th>
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### Bidder’s Project Experience for Project Category 3 - Construction of 14-inch or larger welded steel pipe with minimum 150 psi pressure class and extending for a length of at least 300 linear feet.

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<th>Client Name and Address:</th>
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<th>Client’s Contact Person Name &amp; Phone Number:</th>
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<th>Project Name and Description of Bidder’s Work:</th>
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<tr>
<th>Pipe Size, Material, Pressure Class, and Length:</th>
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<th>Cost of Bidder’s Work:</th>
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### Bidder’s Project Experience for Project Category 4 - Construction of 8-inch or larger PVC pipe with minimum 150 psi pressure class and extending for a length of at least 500 linear feet.

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<th>Client Name and Address:</th>
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<th>Client’s Contact Person Name &amp; Phone Number:</th>
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<th>Project Name and Description of Bidder’s Work:</th>
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<table>
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<tr>
<th>Pipe Size, Material, Pressure Class, and Length:</th>
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<th>Period of Performance:</th>
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<th>Cost of Bidder’s Work:</th>
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D. EXPERIENCE AND TECHNICAL QUALIFICATIONS QUESTIONNAIRE

Personnel:

The Bidder shall identify the key personnel to be assigned to this project in a management, construction supervision or engineering capacity.

PROJECT MANAGER:

1. List name, job title, and percent of time to be allocated to this project:

2. List education and certifications:

3. List years of construction experience relevant to the project:

4. Summarize such experience (list of completed similar projects):

SUPERINTENDENT:

5. List name, job title, and percent of time to be allocated to this project:

6. List education and certifications:

7. List years of construction experience relevant to the project:

8. Summarize such experience (list of completed similar projects):
OTHER PERSONNEL:

1. List name, job title, and percent of time to be allocated to this project:

2. List education and certifications:

3. List years of construction experience relevant to the project:

4. Summarize such experience (list of completed similar projects):

Bidder agrees that personnel named in this Bid will remain on this project in their designated capacities until completion of all relevant Work, unless replaced by personnel of equivalent experience and qualifications approved in advance by the City.

Additional Bidder’s Statements:

If the Bidder feels that there is additional information which has not been included in the questionnaire above, and which would contribute to the qualification review, it may add that information in a statement here or on an attached sheet, appropriately marked:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
E. VERIFICATION AND EXECUTION

These Bid Forms shall be executed only by a duly authorized official of the Bidder:

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

Name of Bidder ____________________________

Signature _________________________________

Name ____________________________

Title _________________________________

Dated ____________________________
NON-COLLUSION DECLARATION

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

The undersigned declares:

I am the ___________________ of ___________________, the party making the foregoing bid.

The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. The bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder. All statements contained in the bid are true. The bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on __________________________[date], at __________________________[city], __________________________[state].

___________________________________________________
(Signature)

___________________________________________________
(Print Name)

___________________________________________________
(Print Title)

___________________________________________________
(Date)
IRAN CONTRACTING ACT CERTIFICATION

(Public Contract Code Section 2200 et seq.)

As required by California Public Contract Code Section 2204, the Contractor certifies subject to penalty for perjury that the option checked below relating to the Contractor’s status in regard to the Iran Contracting Act of 2010 (Public Contract Code Section 2200 et seq.) is true and correct:

☐ The Contractor is not:

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

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

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

☐ The amount of the Contract payable to the Contractor for the Work does not exceed $1,000,000.

Signed______________________________________________________
Title_______________________________________________________
Firm________________________________________________________
Date________________________________________________________

Note: In accordance with Public Contract Code Section 2205, false certification of this form shall be reported to the California Attorney General and may result in civil penalties equal to the greater of $250,000 or twice the Contract Price, termination of the Contract and/or ineligibility to bid on contracts for three years.
Pursuant to Labor Code sections 1725.5 and 1771.1, all contractors and subcontractors that wish to bid on, be listed in a bid proposal, or enter into a contract to perform public work must be registered with the Department of Industrial Relations. See http://www.dir.ca.gov/Public-Works/PublicWorks.html for additional information.

No bid will be accepted nor any contract entered into without proof of the contractor’s and subcontractors’ current registration with the Department of Industrial Relations to perform public work.

Bidder hereby certifies that it is aware of the registration requirements set forth in Labor Code sections 1725.5 and 1771.1 and is currently registered as a contractor with the Department of Industrial Relations.

Name of Bidder: _________________________________

Contractor’s PWCR/DIR Registration Number: ______

Bidder further acknowledges:

1. Bidder shall maintain current DIR registration for the duration of the project.

2. Bidder shall include the requirements of Labor Code sections 1725.5 and 1771.1 in its contract with subcontractors and ensure that all subcontractors are registered at the time of bid opening and maintain registration status for the duration of the project.

3. Failure to submit this form or comply with any of the above requirements may result in a finding that the bid is non-responsive.

Name of Bidder: _________________________________

Signature: _________________________________

Name and Title: _________________________________

Dated: _________________________________
CONTRACT FOR CONSTRUCTION

THIS CONTRACT is made this in the County of Ventura, State of California, by and between the City of Thousand Oaks, hereinafter called City, and ______________________________, hereinafter called Contractor. The City and the Contractor for the considerations stated herein agree as follows:

ARTICLE 1. SCOPE OF WORK. The Contractor shall perform all Work within the time stipulated the Contract and shall provide all labor, materials, equipment, tools, utility services, and transportation to complete all of the Work required in strict compliance with the Contract Documents as specified in Article 5 below for the following Work:

LA GRANADA PUMP STATION – CI 8082

The Contractor and its surety shall be liable to the City for any damages arising as a result of the Contractor’s failure to comply with this obligation.

ARTICLE 2. CONTRACT TIME. Time is of the essence in the performance of the Work. The Work shall be commenced on the date stated in the City’s Notice to Proceed. The Contractor shall complete all Work required by the Contract Documents within 365 calendar days from the commencement date stated in the Notice to Proceed, hereafter the Contract Time. There are intermediate completion milestones that contractor is required to comply with according to the contract documents (See “Summary of Work” Section 01 11 00, Sub-Section 1.15 Allowable Schedule of Work Items). By its signature hereunder, Contractor agrees the time for completion set forth above is adequate and reasonable to complete the Work.

ARTICLE 3. CONTRACT PRICE. The City shall pay to the Contractor as full compensation for the performance of the Contract, subject to any additions or deductions as provided in the Contract Documents, and including all applicable taxes and costs, the sum of ______________________________ Dollars ($__________________________), hereinafter, the Contract Price. Payment shall be made as set forth in the General Conditions.

ARTICLE 4. LIQUIDATED DAMAGES. In accordance with Government Code section 53069.85 and Public Contract Code Section 7102, City shall be compensated for damages incurred due to delays for which the Contractor is responsible. The parties agree that determining City’s exact delay damages is and will continue to be impracticable and extremely difficult. As such, for each calendar day in excess of the time agreed upon for completion of the work, the Contractor shall pay to the City $1500 per day as Liquidated Damages and not as a penalty or forfeiture. Such amount shall constitute the only payment allowed for damages resulting from Contractor caused delays. In the event this is not paid, the Contractor agrees the City may deduct that amount from any money due or that may become due the Contractor under the CONTRACT

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Contract. This Article does not exclude recovery of other damages specified in the Contract Documents.

Consistent with Public Contract Code Section 7102, Contractor will be compensated for damages incurred due to delays for which the City is responsible. The parties agree that determining Contractor’s exact delay damages is and will continue to be impracticable and extremely difficult. As such, for each calendar day in excess of the Contract Time, the City shall pay to the Contractor $1500 per day as Reverse Liquidated Damages and not as a penalty or forfeiture. Such amount shall constitute the only payment allowed for any City caused delays and shall necessarily include all overhead, all profits, all administrative costs, all bond costs, all labor, materials, equipment and rental costs and any other costs, expenses and fees incurred or sustained as a result of such delays. Notice of requests for delay damages and additional days shall be provided to the City within seven (7) days from the discovery of the circumstances giving rise to any delay or three (3) days from the discovery of any latent or subsurface conditions giving rise to a delay.

ARTICLE 5. COMPONENT PARTS OF THE CONTRACT. The “Contract Documents” include only the following documents, each of which is incorporated into this Agreement by reference:

1. Change Orders and Work Change Directives
2. Addenda
3. Special Provisions (or Special Conditions)
4. Technical Specifications
5. Plans (Contract Drawings)
6. Contract for Construction
7. General Conditions
8. Instructions to Bidders
9. Notice Inviting Bids
10. Bid Security or Bid Bond
11. Performance and Payment Bonds
12. Greenbook Standard Specifications (Most Recent Edition; Sections 1-9 Excluded)
13. Standard Plans
14. Reference Documents
15. Contractor’s Bid Forms

The Contractor shall complete the Work in strict accordance with all of the Contract Documents. In case of conflicts between the Contract Documents, the order of precedence shall be as set forth in the General Conditions.

All of the Contract Documents are intended to be complementary. Work required by one of the Contract Documents and not by others shall be done as if required by all. This Contract shall supersede any prior agreement of the parties, whether written or oral.
The Contract can be modified only by a written Change Order executed in accordance with the Contract Documents.

ARTICLE 6. PROVISIONS REQUIRED BY LAW. Each and every provision of law required to be included in these Contract Documents shall be deemed to be included in these Contract Documents. The Contractor shall comply with all requirements of applicable federal, state and local laws, rules and regulations, including, but not limited to, the provisions of the California Labor Code and California Public Contract Code which are applicable to this Work.

ARTICLE 7. INDEMNIFICATION. Contractor shall provide indemnification and defense as set forth in the General Conditions.

ARTICLE 8. PREVAILING WAGES. Contractor shall be required to pay not less than the prevailing rate of wages in accordance with the Labor Code, which rates have been determined by the Director of the California Department of Industrial relations and shall be made available at City Hall or may be obtained online at http://www.dir.ca.gov/dlsr. The wage rates must be posted at the job site.
IN WITNESS WHEREOF, this Contract has been duly executed by the above-named parties, on the day and year above written.

CITY OF THOUSAND OAKS

AL ADAM, Mayor

ATTEST:

Cynthia M. Rodriguez, City Clerk

APPROVED AS TO FORM:
Office of the City Attorney

Felicia Liberman, Assistant City Attorney

APPROVED AS TO ADMINISTRATION:
Andrew P. Powers, City Manager

APPROVED BY DEPARTMENT HEAD:
Clifford G. Finley, Public Works Director

[NAME OF CONTRACTOR]

Name and Title

Name and Title

License Number

DIR Registration Number

CONTRACT

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PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS:

THAT WHEREAS, ___________________________ (hereinafter referred to as “City”) has awarded to ____________________, (hereinafter referred to as the “Contractor”) _________________ a contract for ___________________________ (hereinafter referred to as the “Project”).

WHEREAS, the work to be performed by the Contractor is more particularly set forth in the Contract Documents for the Project dated ____________, (hereinafter referred to as “Contract Documents”), the terms and conditions of which are expressly incorporated herein by reference; and

WHEREAS, the Contractor is required by the Contract Documents to perform the terms thereof and to furnish a bond for the faithful performance of the Contract Documents.

NOW, THEREFORE, we, _________________, the undersigned Contractor and ___________________________ as Surety, a corporation organized and duly authorized to transact business under the laws of the State of California, are held and firmly bound unto the City in the sum of ___________________________ DOLLARS, ($____________), the sum being not less than one hundred percent (100%) of the total amount of the Contract, for which amount well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that, if the Contractor, his or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in the Contract Documents and any alteration thereof made as therein provided, on its part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their intent and meaning; and shall faithfully fulfill all obligations including the one-year guarantee of all materials and workmanship; and shall indemnify and save harmless the City, its officers and agents, as stipulated in the Contract Documents, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

The obligations of Surety hereunder and those created by this performance bond shall continue so long as any obligation of Contractor remains. Nothing herein shall limit the City’s rights or the Contractor or Surety’s obligations under the Contract, law or equity, including, but not limited to, California Code of Civil Procedure section 337.15.

Whenever Contractor shall be, and is declared by the City to be, in default under the Contract Documents, the Surety shall remedy the default pursuant to the Contract Documents, or shall promptly, at the City’s option:

PERFORMANCE BOND
(1) Take over and complete the Project in accordance with all terms and conditions in the Contract Documents; or

(2) Obtain a bid or bids for completing the Project in accordance with all terms and conditions in the Contract Documents and upon determination by Surety of the lowest responsive and responsible bidder, arrange for a Contract between such bidder, the Surety and the City, and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term “balance of the contract price” as used in this paragraph shall mean the total amount payable to Contractor by the City under the Contract and any modification thereto, less any amount previously paid by the City to the Contractor and any other set offs pursuant to the Contract Documents.

(3) Permit the City to complete the Project in any manner consistent with California law and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term “balance of the contract price” as used in this paragraph shall mean the total amount payable to Contractor by the City under the Contract and any modification thereto, less any amount previously paid by the City to the Contractor and any other set offs pursuant to the Contract Documents.

Surety expressly agrees that the City may reject any contractor or subcontractor which may be proposed by Surety in fulfillment of its obligations in the event of default by the Contractor.

Surety shall not utilize Contractor in completing the Project nor shall Surety accept a bid from Contractor for completion of the Project if the City, when declaring the Contractor in default, notifies Surety of the City’s objection to Contractor’s further participation in the completion of the Project.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project to be performed thereunder shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project.

As a part of the obligation secured hereby and in addition to the amount specified therefore, there shall be included costs and reasonable expenses and fees, including reasonable attorney’s fees, incurred by City in successfully enforcing such obligations created by this performance bond, all to be taxed as costs and included in any judgment rendered.

PERFORMANCE BOND

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IN WITNESS WHEREOF, we have hereunto set our hands and seals this ______ day of ______________, 20__.  

_____________________________________
CONTRACTOR/PRINCIPAL

_____________________________________
Name

By___________________________________

SURETY:

By:___________________________________

Attorney-In-Fact

Signatures of those signing for the Contractor and Surety must be notarized and evidence of corporate authority attached.

The rate of premium on this bond is _____________ per thousand. The total amount of premium charges, $_______________________________.  
(The above must be filled in by corporate attorney.)

THE FOLLOWING INFORMATION IS REQUIRED

Any claims under this bond may be addressed to:

(Name and Address of Surety) __________________________________________

___________________________________________
___________________________________________

(Name and Address of Agent or Representative for service of process in California, if different from above)

___________________________________________

___________________________________________

(Telephone number of Surety and Agent or Representative for service of process in California)

___________________________________________

___________________________________________

___________________________________________

___________________________________________

___________________________________________

PERFORMANCE BOND
NOTE: A copy of the Power-of-Attorney to local representatives of the bonding company must be attached hereto.

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of __________________________ )

On _______________________ before me, (insert name and title of the officer)

personally appeared ____________________________________________________________,
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.
PAYMENT BOND (LABOR AND MATERIALS)

KNOW ALL MEN BY THESE PRESENTS That

WHEREAS, the City of ________________ (hereinafter designated as the “City”), by action taken or a resolution passed ___________ , 20____ has awarded to ________________ hereinafter designated as the “Principal,” a contract for the work described as follows:

__________________________

______ (the “Work”); and

WHEREAS, Principal is required to furnish a bond in connection with the contract described above; providing that if Principal or any of its Subcontractors shall fail to pay for any materials, provisions, provender, equipment, or other supplies used in, upon, for or about the performance of the work contracted to be done, or for any work or labor done thereon of any kind, or for amounts due under the Unemployment Insurance Code or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of Principal and its Subcontractors with respect to such work or labor the Surety on this bond will pay for the same to the extent hereinafter set forth.

NOW THEREFORE, we, the Principal and __________________________ as Surety, are held and firmly bound unto the City in the penal sum of ______________ Dollars ($___________) lawful money of the United States of America, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if Principal, his or its subcontractors, heirs, executors, administrators, successors or assigns, shall fail to pay any of the persons named in Section 9100 of the Civil Code, fail to pay for any materials, provisions or other supplies, used in, upon, for or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or amounts due under the Unemployment Insurance Code with respect to work or labor performed under the contract, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department or Franchise Tax Board from the wages of employees of the contractor and his subcontractors pursuant to Section 18663 of the Revenue and Taxation Code, with respect to such work and labor the Surety or Sureties will pay for the same, in an amount not exceeding the sum herein above specified, and also, in case suit is brought upon this bond, Surety or Sureties shall pay all litigation expenses incurred by the City in such suit, including reasonable attorneys’ fees, court costs, expert witness fees and investigation expenses.

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

PAYMENT (LABOR AND MATERIALS) BOND

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It is further stipulated and agreed that the Surety on this bond shall not be exonerated or released from the obligation of this bond by any change, extension of time for performance, addition, alteration or modification in, to, or of any contract, plans, specifications, or agreement pertaining or relating to any scheme or work of improvement herein above described, or pertaining or relating to the furnishing of labor, materials, or equipment therefore, nor by any change or modification of any terms of payment or extension of the time for any payment pertaining or relating to any scheme or work of improvement herein above described, nor by any rescission or attempted rescission of the contract, agreement or bond, nor by any conditions precedent or subsequent in the bond attempting to limit the right of recovery of claimants otherwise entitled to recover under any such contract or agreement or under the bond, nor by any fraud practiced by any person other than the claimant seeking to recover on the bond and that this bond be construed most strongly against the Surety and in favor of all persons for whose benefit such bond is given, and under no circumstances shall Surety be released from liability to those for whose benefit such bond has been given, by reason of any breach of contract between the owner or City and original contractor or on the part of any obligee named in such bond, but the sole conditions of recovery shall be that claimant is a person described in Section 9100 of the Civil Code, and has not been paid the full amount of his claim and that Surety does hereby waive notice of any change, extension of time, addition, alteration or modification herein mentioned and waives the provisions of Section 2819 and 2845 of the California Civil Code.

As a part of the obligation secured hereby and in addition to the amount specified therefore, there shall be included costs and reasonable expenses and fees, including reasonable attorney's fees, incurred by City in successfully enforcing such obligations created by this payment bond, all to be taxed as costs and included in any judgment rendered.

IN WITNESS WHEREOF, we have hereunto set our hands and seals this _______ day of ______________, 20___.

(Corporate Seal of Principal, if corporation) Principal (Property Name of Contractor)

By __________________________
(Signature of Contractor)

(Sign of Surety)

By __________________________
(Signature of Surety)

By __________________________
Attorney in Fact

Signatures of those signing for the Contractor and Surety must be notarized and evidence of corporate authority attached. A copy of the Power-of-Attorney to local representatives of the bonding company must be attached hereto.

PAYMENT (LABOR AND MATERIALS) BOND

54
THE FOLLOWING INFORMATION IS

Any claims under this bond may be addressed to:

(Name and Address of Surety) _____________________________________________
_____________________________________________________________________
_____________________________________________________________________

(Name and Address of Agent or Representative for service of process in California, if different from above)

(Telephone number of Surety and Agent or Representative for service of process in California)
ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of ____________________________ )

On __________________________ before me, (insert name and title of the officer)

personally appeared ________________________________________________________, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.
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GENERAL CONDITIONS

ARTICLE 1. DEFINITIONS

a. Acceptable, Acceptance or words of similar import shall be understood to be the acceptance of the Engineer and/or the City.

b. Act of God is an earthquake of magnitude 3.5 or more on the Richter scale or a tidal wave.

c. Applicable Laws means laws, statutes, ordinances, rules, codes, regulations, permits, and licenses of any kind, issued by governmental authorities or private authorities with jurisdiction (including utilities), to the extent they apply to the Work.

d. Contract Documents includes only those items listed in Article 5 of the Contract for Construction.

e. City shall mean the City of Thousand Oaks, acting through properly authorized agents, such as the Engineer or such other agents acting within the scope of the particular duties entrusted to them. Also sometimes referred to as the “City’s Representative” or “Representative” in the Contract Documents. The terms City and Owner may be used interchangeably.

f. Contractor shall mean the entity identified in the Contract for Construction with which the City has contracted for performance of the Work.

g. Day shall mean calendar day unless otherwise specifically designated.

h. Engineer shall mean the City Engineer of the City, Director of Public Works, or other person designated by the City, acting either directly or through authorized agents.

i. Material shall include machinery, equipment, manufactured articles, or construction such as form work, fasteners, etc., and any other classes of material to be furnished in connection with the Contract, whether or not it will be incorporated into the Work. All material shall be new unless specified otherwise.

j. Perform shall mean that the Contractor, at Contractor’s expense, shall take all actions necessary to complete the Work, including furnishing necessary labor, tools, and equipment, and providing and installing Materials that are indicated, specified, or required to complete such performance.

k. Project means the planning, design, development, financing, construction, and completion of the public work of improvement, which includes, but is not
necessarily limited to, the Work. The Project may include construction that will be performed by others directly or through separate contracts

l. **Provide** shall mean to complete in place, that is furnish, install, test and make ready for use.

m. **Recyclable Waste Materials** shall mean materials removed from the Site which are required to be diverted to a recycling center rather than an area landfill. Recyclable Waste Materials include asphalt, concrete, brick, concrete block, and rock.

n. **Specifications** means that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the work. The Work shall be done in accordance with the Standard Specifications for Public Works Construction ("Greenbook"), most recent Edition, including all current supplements, addenda, and revisions thereof. In the case of conflict between the Greenbook and the Contract Documents, the Contract Documents shall prevail.

o. **Work** means the construction or related work that is to be performed under the Contract, including furnishing all labor, materials, equipment, and services. The Work may be all or a portion of the Project.

**ARTICLE 2. CONTRACT DOCUMENTS**

a. **Contract Documents.** The Contract Documents are complementary, and what is called for by one shall be as binding as if called for by all.

b. **Interpretations.** The Contract Documents are intended to be fully cooperative and to be complementary. If Contractor observes that any of the Contract Documents are in conflict, the Contractor shall promptly notify the City in writing. In case of conflicts between the Contract Documents, the order of precedence shall be as follows:

1. Change Orders or Work Change Directives, the most recent first
2. Addenda, the most recent first
3. Special Provisions (or Special Conditions)
6. Contract for Construction
7. General Conditions
8. Instructions to Bidders
9. Notice Inviting Bids
10. City Standard Plans (City Road/Water/Wastewater Standards)

**CONDITIONS OF CONTRACT**

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11. Greenbook Standard Specifications (Sections 1-8 Excluded)  
12. Caltrans Standard Plans Most Recent Edition (Sections 1-9 Excluded)  
13. Reference Documents  
14. Contractor’s Bid Forms  

With reference to the Drawings, the order of precedence shall be as follows:  

1. Figures govern over scaled dimensions  
2. Detail drawings govern over general drawings  
3. Addenda or Change Order drawings govern over Contract Drawings  
4. Contract Drawings govern over Standard Drawings  
5. Contract Drawings govern over Shop Drawings  

c. **Conflicts in Contract Documents.** Notwithstanding the orders of precedence established above, in the event of conflicts, the higher standard shall always apply.  

d. **Organization of Contract Documents.** Organization of the Contract Documents into divisions, sections, and articles, and arrangement of drawings shall not prohibit the Contractor in dividing Work among subcontractors or in establishing the extent of Work to be performed by any trade.  

**ARTICLE 3. CONTRACT DOCUMENTS: COPIES & MAINTENANCE**  
Contractor will be furnished, free of charge, one (1) complete set of the Contract Documents after award. Additional copies may be obtained at cost of reproduction. Contractor shall maintain a complete, clean, undamaged set of Contract Documents at the Site.  

**ARTICLE 4. DETAIL DRAWINGS AND INSTRUCTIONS**  

a. **Examination of Contract Documents.** Before commencing any portion of the Work, Contractor shall again carefully examine all Contract Documents, the Site and other information given to Contractor as to materials and methods of construction and other Work requirements. Contractor shall immediately notify the City of any potential error, inconsistency, ambiguity, conflict or lack of detail or explanation. If Contractor performs, permits, or causes the performance of any Work which is in error, inconsistent or ambiguous, or not sufficiently detailed or explained in the Contract Documents, Contractor shall bear any and all resulting costs, including, without limitation, the cost of correction. In no case shall the Contractor or any subcontractor proceed with Work if uncertain as to the applicable requirements.  

b. **Request for Information; Additional Instructions.** Contractor may make a written request for information from the City to address any error, inconsistency, ambiguity, conflict or lack of detail or explanation in the Contract Documents.  

**CONDITIONS OF CONTRACT**  
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The City will provide any required additional instructions, by means of drawings or other written direction, necessary for proper execution of Work. City shall respond to Requests for Information within a reasonable time. For purposes of this section ten (10) calendar days shall constitute a reasonable time.

c. **Quality of Parts, Construction and Finish.** All parts of the Work shall be of the best quality of their respective kinds and the Contractor must use all diligence to inform itself fully as to the required construction and finish. In no case shall Contractor proceed with the Work without obtaining the City’s written approval as required for the proper performance of Work.

d. **Contractor’s Variation from Contract Document Requirements.** If Contractor varies from the requirements of the Contract Documents including the requirement to comply with all Applicable Laws, the City may at any time, before or after completion of the Work, order the improper Work removed, remade or replaced by the Contractor at the Contractor’s sole expense.

### ARTICLE 5. EXISTENCE OF UTILITIES AT THE SITE

a. **Existing Utilities**
   1. The location of known existing utilities and pipelines are shown on the Plans in their approximate locations. However, nothing herein shall be deemed to require the Owner to indicate the presence of existing service laterals or appurtenances whenever the presence of such utilities on the site of the project can be inferred from the presence of other visible facilities, such as buildings, cleanouts, meter and junction boxes, on or adjacent to the site of the Project.

b. **Utility Location**
   1. It shall be the Contractor’s responsibility to determine the exact location and depth of all utilities, including service connections, which have been marked by the respective utility owners and which the Contractor believes may affect or be affected by the Contractor’s operations. The Contractor shall not be entitled to additional compensation nor time extensions for work necessary to avoid interferences nor for repair to damaged utilities if the Contractor does not expose all such existing utilities as required by this section.

   2. The locating of utilities shall be in conformance with Government Code Section 4216 except for the Owner’s utilities located on the Owner’s property and not on public right-of-way.

   3. A “High Priority Subsurface Installation” is defined in Government Code Section 4216 (e) as “high-pressure natural gas pipelines with normal...
operating pressures greater than 415kPA gauge (60psig) or greater than six inches nominal pipe diameter, petroleum pipelines, pressurized sewage pipelines, high-voltage electric supply lines, conductors, or cables that have a potential to ground of greater than or equal to 60kv, or hazardous materials pipelines that are potentially hazardous to workers or the public if damaged."

4. A “Subsurface Installation” is defined in Government Code Section 4216 (l) as “any underground pipeline, conduit, duct, wire, or other structure, except non pressurized sewer lines, non pressurized storm drains, or other non pressurized drain lines.”

5. Pursuant to Government Code Section 4216.2 the Contractor shall contact the appropriate regional notification center at least two (2) working days but not more than 14 calendar days before performing any excavation. The Contractor shall request that the utility owners conduct a utility survey and mark or otherwise indicate the location of their service. The Contractor shall furnish to the Construction Manager written documentation of its contact(s) with the regional notification center prior to commencing excavation at such locations.

6. After the utility survey is completed, the Contractor shall commence “potholing” or hand digging to determine the actual location of the pipe, duct, or conduit. The Construction Manager shall be given notice prior to commencing potholing operations. The Contractor shall uncover all piping and conduits, to a point one (1) foot below the pipe, where crossings, interferences, or connections are shown on the Drawings, prior to trenching or excavating for any pipe or structures, to determine actual elevations. New pipelines shall be laid to such grade as to clear all existing facilities, which are to remain in service for any period subsequent to the construction of the run of pipe involved.

7. The Contractor's attention is directed to the requirements of Government Code Section 4216.2 (a)(2) which provides: “When the excavation is proposed within 10 feet of a high priority subsurface installation, the operator of the high priority subsurface installation shall notify the excavator of the existence of the high priority subsurface installation prior to the legal excavation start date and time, as such date and time are authorized pursuant to paragraph (1) of subdivision (a) of 4216.2. The excavator and the operator or its representative shall conduct an onsite meeting at a mutually-agreed-on time to determine actions or activities required to verify the location of the high priority subsurface installation prior to start time.” The Contractor shall notify the Construction Manager in advance of this meeting.
c. **Utility Relocation and Repair**

1. If interferences occur at locations other than those indicated in the Contract Documents with reasonable accuracy, the Contractor shall notify the Construction Manager in writing. The Construction Manager will supply a method for correcting said interferences in accordance with the responsibilities of this section and Government Code Section 4215. To the extent any delay is caused thereby, Contractor shall submit a notice of delay within three (3) days of discovery of the circumstances giving rise to the delay in accordance with Article 43 Changes and Extra Work.

2. Care shall be exercised by the Contractor to prevent damage to adjacent existing facilities and public or private works; where equipment will pass over these obstructions, suitable planking shall be placed. If high priority subsurface installations are damaged and the operator cannot be contacted, the Contractor shall call 911 emergency services.

3. The Owner will compensate the Contractor for the costs of locating and repairing damage not due to the failure of the Contractor to exercise reasonable care, and for removing or relocating such main or trunk line utility facilities not indicated in the Contract Documents with reasonable accuracy, and for the cost of equipment on the Project necessarily idled during such work. The payment for such costs will be made as provided in Article 43, Changes and Extra Work. The Contractor shall not be assessed liquidated damages for delay in completion of the Project, when such delay is caused by the failure of the Owner or utility company to provide for removal or relocation of such utility facilities. Requests for extensions of time arising out of utility relocation or repair delays shall be filed in accordance with Article 38, Time For Completion and Liquidated Damages, and Article 43, Changes and Extra Work.

4. The public utility, where it is the owner of the affected utility, shall have the sole discretion to perform repairs or relocation work or permit the Contractor to do such repairs or relocation work at a reasonable price. The right is reserved to the Owner and the owners of utilities or their authorized agents to enter upon the Work area for the purpose of making such changes as are necessary for the rearrangement of their facilities or for making necessary connections or repairs to their properties. The Contractor shall cooperate with forces engaged in such work and shall conduct its operations in such a manner as to avoid any unnecessary delay or hindrance to the work being performed by such forces and shall allow the respective utilities time to relocate their facility.

5. When the Contract Documents indicate that a utility is to be relocated, altered or constructed by others, the Owner will conduct all negotiations
with the utility company and the work will be done at no cost to the Contractor, unless otherwise stipulated in the Agreement.

6. Temporary or permanent relocation or alteration of utilities desired by the Contractor for its own convenience shall be the Contractor’s responsibility and it shall make arrangements and bear all costs for such work.

ARTICLE 6. SCHEDULE

a. Schedule. Within ten (10) days after the Notice of Award, Contractor shall prepare a Preliminary Work schedule using computerized Critical Path Method (CPM) scheduling and shall submit it for the City’s review. The receipt or review of any schedules by the City shall not in any way relieve the Contractor of its obligations under the Contract Documents, nor shall it modify the Contract Time. The Contractor is fully responsible to determine and provide for any and all staffing and resources at levels which allow for the required quality and timely completion of the Work. Contractor’s failure to incorporate all elements of Work or any inaccuracy in the schedule shall not excuse the Contractor from performing all of the required Work within the Contract Time. If the Initial Baseline Schedule is not received by the time the first payment under the Contract is due, Contractor shall not be paid until the schedule is received, reviewed and accepted by the City.

b. Schedule Contents. The schedule shall allow enough time for inclement weather, in accordance with Section 01 11 00 Summary of Work. The schedule shall indicate the beginning and completion dates of all phases of construction; critical path for all critical, sequential time related activities; and “float time” for all “slack” or “gaps” in the non-critical activities. The schedule shall clearly identify all staffing and other resources which in the Contractor’s judgment are needed to complete the Work within the Contract Time. The schedule shall clearly state the number of staff to be used on each daily segment of the Work. Schedules indicating early or late completion shall not modify or have any effect on the Contract Time, regardless of whether the schedules are reviewed and/or accepted by the City. For purposes of determining Liquidated Damages or Reverse Liquidated Damages, the Contract Time shall control and may only be altered by a duly authorized change order.

c. Schedule Updates. Contractor shall continuously update its construction schedule. Contractor shall submit an updated and accurate construction schedule to the City whenever requested to do so by City and with each progress payment request. The City may withhold progress payments or other amounts due under the Contract Documents if Contractor fails to submit an updated and accurate construction schedule. Upon the City’s request, Contractor shall submit any schedules or updates to the City in the native electronic format of the software used to create the schedule.
ARTICLE 7. SUBSTITUTIONS

a. Pursuant to Public Contract Code Section 3400(b) the City may make a finding that is described in the Notice Inviting Bids that designates certain products, things, or services by specific brand or trade name.

b. Unless specifically designated in the Contract Documents, whenever any material, process, or article is indicated or specified by grade, patent, or proprietary name or by name of manufacturer, such Specifications shall be deemed to be used for the purpose of facilitating the description of the material, process or article desired and shall be deemed to be followed by the words “or equal.” Contractor may, unless otherwise stated, offer for substitution any material, process or article which is substantially equal or better in every respect to what is specified in the Contract Documents.

c. Contractor shall submit written requests for substitution or any “equal” material, process or article, together with substantiating data, no later than thirty-five (35) days after award of the Contract. To facilitate the construction schedule and sequencing, some requests may need to be submitted before thirty-five (35) days after award of Contract. Provisions regarding submission of substitution requests shall not in any way authorize an extension of the Contract Time. If a proposed “equal” substitution is rejected, Contractor shall be responsible for providing the specified material, process or article without adjustment to the Contract Price or Contract Time. The City has the complete and sole discretion to determine if a material, process or article is an “equal” material, process or article that may be substituted.

d. Information required to substantiate requests for substitutions of an “equal” material, process or article data shall include a signed affidavit from the Contractor stating that, and describing how, the proposed “equal” material, process or article is equivalent to that specified in every way except as listed on the affidavit. Substantiating data shall include any and all illustrations, specifications, and other relevant material, including but not limited to, catalog information which describes the requested substitute “equal” material, process or article, and substantiates that it is an “equal” to the specified material, process or article. The substantiating data must also include information regarding the durability and lifecycle cost of the proposed substituted “equal” material, process or article. Failure to submit all the required substantiating data, including the signed affidavit, to the City in a timely fashion will result in the rejection of the proposed substitution.

e. The Contractor shall bear all of the City’s costs associated with the review of substitution requests, including review by design professionals.
f. The Contractor shall be responsible for paying all costs related to a substituted “equal” material, process or article.

g. Contractor is directed to the Special Conditions (if any) to review any findings made pursuant to Public Contract Code section 3400.

ARTICLE 8. SHOP DRAWINGS

a. Contractor shall check and verify all field measurements and shall submit with such promptness as to provide adequate time for review and cause no delay in his own Work or in that of any other contractor, subcontractor, or worker on the Work, six (6) copies of all shop or setting drawings, calculations, schedules, and materials list, and all other provisions required by the Contract. Contractor shall sign all submittals affirming that submittals have been reviewed and approved by Contractor prior to submission to City. Each signed submittal shall affirm that the submittal meets all the requirements of the Contract Documents except as specifically and clearly noted and listed on the cover sheet of the submittal.

b. Contractor shall promptly address any City comments and resubmit. City’s review of shop drawings shall not relieve Contractor from responsibility for deviations from the Contract Documents unless Contractor has, in writing, called City’s attention to such deviations at time of submission and has secured the City’s written approval. City’s review of shop drawings shall not relieve Contractor from responsibility for errors in shop drawings.

ARTICLE 9. SUBMITTALS

a. Contractor shall furnish to the City for approval, prior to purchasing or commencing any Work, a log of all samples, material lists and certifications, mix designs, schedules, and other submittals, as required in the Specifications. The log shall indicate whether samples will be provided in accordance with other provisions of this Contract.

b. Contractor will provide samples and submittals, together with catalogs and supporting data required by the City, to the City within a reasonable time period to provide for adequate review and avoid delays in the Work.

c. The requirements in Articles 8 and 9 shall not justify any extension of the Contract Time. City will review such samples, but only for conformance with design concept of work and for compliance with information given in the Contract Documents. Work shall be in accordance with approved samples and submittals.

ARTICLE 10. MATERIALS

a. Except as otherwise specifically stated in the Contract Documents, Contractor shall provide and pay for all materials, labor, tools, equipment, water, lights,
power, transportation, superintendence, temporary constructions of every nature, and all other services and facilities whatsoever necessary to execute and complete this Contract within the Contract Time.

b. Unless otherwise specified, all materials shall be new and the best of their respective kinds and grades as noted and/or specified, and workmanship shall be of good quality.

c. Materials shall be furnished in ample quantities and at such times as to ensure uninterrupted progress of the Work and shall be stored properly and protected as required by the Contract Documents. Contractor shall be entirely responsible for damage or loss by weather or other causes to materials or Work until City has accepted the Work.

d. No materials, supplies, or equipment for Work under this Contract shall be purchased subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. Contractor warrants good title to all material, supplies, and equipment installed or incorporated in the work and agrees upon completion to deliver the Work to the City free from any claims, liens, or encumbrances.

e. Materials stored on the Site shall be stored in such manner so as not to interfere with any operations of the City or any independent contractor.

ARTICLE 11. CONTRACTOR’S SUPERVISION

Contractor shall continuously keep at the Site, a competent and experienced full-time superintendent that is acceptable to the City. The Superintendent must be able to proficiently speak, read and write in English, and shall be fully responsible for all jobsite safety. Contractor shall continuously provide efficient supervision of the Work.

ARTICLE 12. WORKERS

a. Contractor shall at all times enforce strict discipline and good order among its employees and subcontractors. Contractor shall not employ or allow subcontractors to employ on the Work any unfit person or any one not skilled in the Work assigned to him or her.

b. Any person in the employ of the Contractor or a subcontractor whom the City may deem incompetent or unfit shall be dismissed from the Work and shall not be employed on the Work except with the written approval of the City.

ARTICLE 13. SUBCONTRACTORS

a. Contractor agrees to bind every subcontractor to the terms of the Contract Documents as far as such terms are applicable to subcontractor’s portion of the

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Work. Contractor shall be as fully responsible to the City for the acts and
omissions of its subcontractors and of persons either directly or indirectly
employed by its subcontractors, as Contractor is for acts and omissions of
persons directly employed by Contractor. Nothing contained in these Contract
Documents shall create any contractual relationship between any subcontractor
and the City.

b. Contractor must comply with the requirements of the Subletting and
Subcontracting Fair Practices Act, Public Contract Code section 4100 et seq.,
before replacing a subcontractor listed in the bid or performing work with its own
forces for which a subcontractor was listed.

ARTICLE 14. PERMITS AND LICENSES

Permits and licenses necessary for prosecution of the Work shall be secured and paid
for by Contractor, unless otherwise specified in the Contract Documents.

a. Contractor shall obtain and pay for all other permits and licenses required for the
Work, including but not limited to, excavation permit and for plumbing,
mechanical and electrical work and for operations in or over public streets or right
of way under jurisdiction of public agencies other than the City.

b. The Contractor shall arrange and pay for all off-site inspection of the Work
related to permits and licenses, including certification, required by the
specifications, drawings, or by governing authorities, except for such off-site
inspections delineated as the City's responsibility pursuant to the Contract
Documents.

c. Before acceptance of the Work, the Contractor shall submit all licenses, permits,
certificates of inspection and required approvals to the City.

ARTICLE 15. UTILITY USAGE

a. All temporary utilities, including but not limited to electricity, water, gas, and
telephone, used on the Work shall be furnished and paid for by Contractor.
Contractor shall provide necessary temporary distribution systems, including
meters, if necessary, from distribution points to points on the Work where the
utility is needed. Upon completion of the Work, Contractor shall remove all
temporary distribution systems.

b. Contractor shall provide necessary and adequate utilities and pay all costs for
water, electricity, gas, oil, and sewer charges required for completion of the
Work, including but not limited to startup and testing required in the Contract
Documents.
c. All permanent meters installed shall be listed in the Contractor’s name until the Work is accepted.

d. If Work is to be performed in existing City facilities, Contractor may, with prior written approval of the City, use the City’s existing utilities. If Contractor uses City utilities, it shall compensate the City for utilities used.

ARTICLE 16. INSPECTION FEES FOR PERMANENT UTILITIES

All inspection fees and other municipal charges for permanent utilities including, but not limited to, sewer, electrical, phone, gas, water, and irrigation shall be paid for by the City. Contractor shall be responsible for arranging the payment of such fees, but inspection fees and other municipal fees relating to permanent utilities shall be paid by the City. Contractor may either request reimbursement from the City for such fees, or shall be responsible for arranging and coordination with City for the payment of such fees.

ARTICLE 17. TRENCHES

a. Trenches Five Feet or More in Depth.

1. The Contractor shall submit to the City, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any trench or trenches five feet or more in depth. If the plan varies from shoring system standards forth in the Construction Safety Orders of the Division of Industrial Safety in Title 8, Subchapter 4, Article 6, California Code of Regulations, the plan shall be prepared by a registered civil or structural engineer. The plan shall not be less effective than the shoring, bracing, sloping, or other provisions of the Construction Safety Orders, as defined in the California Code of Regulations, and all costs therefor shall be included in the Contract Price. Nothing in this section shall be deemed to allow the use of a shoring, bracing, sloping, or other protective system less effective than that required by the Construction Safety Orders. Nothing in this section shall be construed to impose a tort liability on the Owner, any of its officers, officials, partners, employees, agents, consultants or volunteers. The Owner's review of the Contractor's excavation plan is only for general conformance to the Construction Safety Orders.

2. Prior to commencing any excavation, the Contractor shall designate in writing to the Owner the "competent person(s)" with the authority and responsibilities designated in the Construction Safety Orders.

b. Excavations Deeper than Four Feet. If work under this Contract involves digging trenches or other excavation that extends deeper than four feet below the
surface, Contractor shall promptly within 3 days, and before the following conditions are disturbed, notify the City, in writing, of any:

1. Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code that is required to be removed to a Class I, 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 on 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.

The City shall promptly investigate the conditions, and if it finds that the conditions so materially differ, or do involve hazardous waste, and cause a decrease or increase in Contractor’s cost of, or the time required for, performance of any part of the Work, shall issue a change order under the procedures described in the Contract Documents.

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

ARTICLE 18. DIVERSION OF RECYCLABLE WASTE MATERIALS

In compliance with the applicable City’s waste reduction and recycling efforts, Contractor shall divert all Recyclable Waste Materials to appropriate recycling centers. Contractor will be required to submit weight tickets and written proof of diversion with its monthly progress payment requests. Contractor shall complete and execute any certification forms required by City or other applicable agencies to document Contractor’s compliance with these diversion requirements. All costs incurred for these waste diversion efforts shall be the responsibility of the Contractor.

ARTICLE 19. REMOVAL OF HAZARDOUS MATERIALS

Should Contractor encounter material reasonably believed to be polychlorinated biphenyl (PCB) or other toxic wastes, hazardous substance and hazardous materials as defined in California state or federal law at the Site which have not been rendered harmless, the Contractor shall immediately stop work at the affected area and shall
report the condition to the City in writing. The City shall contract for any services required to directly remove and/or abate PCBs, hazardous substances, other toxic wastes and hazardous materials, and shall not require the Contractor to subcontract for such services. The Work in the affected area shall not thereafter be resumed except by written agreement of the City and Contractor.

ARTICLE 20. SANITARY FACILITIES

Contractor shall provide sanitary temporary toilet buildings for the use of all workers. All toilets shall comply with local codes and ordinances. Toilets shall be kept supplied with toilet paper and shall have workable door fasteners. Toilets shall be serviced no less than once weekly and shall be present in a quantity of not less than 1 per 20 workers or as required by CAL-OSHA regulation. The toilets shall be maintained in a sanitary condition at all times. Use of toilet facilities in the Work under construction shall not be permitted. Any other Sanitary Facilities required by CAL-OSHA shall be the responsibility of the Contractor.

ARTICLE 21. AIR POLLUTION CONTROL

Contractor shall comply with all air pollution control rules, regulations, ordinances and statutes. All containers of paint, thinner, curing compound, solvent or liquid asphalt shall be labeled to indicate that the contents fully comply with the applicable material requirements.

Without limiting the foregoing, Contractor must fully comply with all applicable laws, rules and regulations in furnishing or using equipment and/or providing services, including, but not limited to, emissions limits and permitting requirements imposed by the Air Quality Management District with jurisdiction over the Project and/or California Air Resources Board (CARB). Contractor shall specifically be aware of the application of these limits and requirements to "portable equipment", which definition includes any item of equipment with a fuel-powered engine. Contractor shall indemnify City against any fines or penalties imposed by the air quality management district, CARB, or any other governmental or regulatory agency for its violations of Applicable Laws as well as those of its subcontractors or others for whom Contractor is responsible under its indemnity obligations provided for in the Contract Documents.

ARTICLE 22. WATER QUALITY MANAGEMENT AND COMPLIANCE

a. Storm, surface, ground, nuisance, or other waters may be encountered at various times during construction of the Work. Therefore, the Contractor hereby acknowledges that it has investigated the risk arising from such waters, has prepared its Bid accordingly, and assumes any and all risks and liabilities arising therefrom.

b. Contractor shall keep itself and all subcontractors, staff, and employees fully informed of and in compliance with all local, state and federal laws, rules and
regulations that may impact, or be implicated by the performance of the Work including, without limitation, all applicable provisions of the City’s ordinances regulating discharges of storm water; the Federal Water Pollution Control Act (33 U.S.C. § 13000 et seq.); the California Porter-Cologne Water Quality Control Act (Cal Water Code §§ 13000-14950); and any and all regulations, policies, or permits issued pursuant to any such authority. These include, but are not limited to California State Water Resources Control Board Order Number 2009-0009-DWQ (NPDES Permit No. CAS000002), as amended by Order Numbers 2010-0014-DWQ, 2012-0006-DWQ, and any subsequent amendment to or renewal thereof, State Water Resources Control Board Order No. 2013-0001-DWQ (NPDES Order No. CAS000004), Los Angeles Regional Water Quality Control Board Order No. R4-2012-0077, and any amendment or renewal thereof.

c. Contractor shall comply with all conditions of the State Water Resources Control Board (“State Water Board”) National Pollutant Discharge Elimination System General Permit for Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction Activity (“Construction General Permit”) for all construction activity which results in the disturbance of in excess of one acre of total land area or which is part of a larger common area of development or sale. Contractor shall comply with the lawful requirements of the City, and any other applicable municipality, drainage district, or other local agency with jurisdiction over the location where the Work is to be conducted, regarding discharges of storm water to separate storm drain systems or other watercourses under their jurisdiction, including applicable requirements in municipal storm water management programs.

d. Unless otherwise specified in the Special Conditions or other portion of the Contract Documents, the City (or a consultant hired by the City) has prepared a Storm Water Pollution Prevention Plan (“SWPPP”) for the Project Site and obtained coverage under the Construction General Permit. A copy of the SWPPP is available at the City’s office for public review. Contractor shall at all times comply with all applicable requirements of the SWPPP and the Construction General Permit, including ensuring that all Construction General Permit-related tasks are completed by individuals with the requisite certifications. The Contractor shall draft and coordinate submission of any necessary amendments to the SWPPP as the project moves through the construction process and shall provide draft amendments to the SWPPP for review and approval by the City prior to submission, which approval shall not be unreasonably withheld. Contractor shall promptly provide all reports and other documentation required by the City to ensure compliance with the SWPPP and the Construction General Permit, to prepare amendments to the SWPPP or to comply with any requirements of state or federal law or regulation. Contractor shall cooperate with the City in providing or preparing any documents that may be submitted to the State Board. Contractor shall incorporate all costs associated with compliance with the SWPPP throughout the course of construction into its bid.
e. In addition to any other available remedies, if Contractor fails to proceed in a manner that complies with the requirements of the Construction General Permit, the City expressly reserves the right to hire additional contractors to maintain compliance at the Work site. Whether Contractor has adequately maintained compliance with the Construction General Permit shall be the City’s sole determination. Contractor shall be responsible for any costs incurred by the City in implementing a SWPPP for the Work site.

f. Notwithstanding the above, for those Work sites where construction activity results in the disturbance of less than one acre of total land area and/or do not need coverage under the Construction General Permit, the Contractor shall be responsible for preparing and implementing an Erosion and Sediment Control Plan in accordance with the City’s Municipal Code and State Water Resources Control Board Order No. 2013-0001-DWQ (NPDES Order No. CAS000004) and any amendment to or renewal thereof.

g. Failure to comply with the Construction General Permit, laws, regulations, and ordinances listed in this Article is a violation of federal and state law. Notwithstanding any other indemnity contained in this Agreement, Contractor agrees to indemnify and hold harmless the City, its officials, officers, agents, employees and authorized volunteers from and against any and all claims, demands, fees, costs, expenses, or losses or liabilities of any kind or nature which the City, its officials, officers, agents, employees and authorized volunteers may sustain or incur for noncompliance with the Permit, laws, regulations, and ordinances listed above, arising out of or in connection with the Work, except for liability resulting from the sole established negligence, willful misconduct or active negligence of the City, its officials, officers, agents, employees or authorized volunteers.

h. City reserves the right to defend any enforcement action or civil action brought against the City for Contractor’s failure to comply with any applicable water quality law, regulation, or policy. Contractor hereby agrees to be bound by, and to reimburse the City for the costs associated with, any settlement reached between the City and any relevant enforcement entity.

**ARTICLE 23. CLEANING UP**

a. Contractor at all times shall keep Site free from debris such as waste, rubbish, and excess materials and equipment. Contractor shall not store debris under, in, or about the Site. Upon completion of Work, Contractor shall clean the interior and exterior of the building or improvements including fixtures, equipment, walls, floors, ceilings, roofs, window sills and ledges, horizontal projections, and any areas where debris has collected so surfaces are free from foreign material or discoloration. Contractor shall clean and polish all glass, plumbing fixtures, and finish hardware and similar finish surfaces and equipment; Contractor shall
remove temporary Stormwater BMP’s, fencing, barricades, planking, construction toilets and similar temporary facilities from Site. Contractor shall clean all buildings, asphalt and concrete areas to the degree necessary to remove oil, grease, fuel, utility markings or other stains caused by Contractor’s operations or equipment.

b. Contractor shall fully clean up the site at the completion of the Work or such other time as City may reasonably request. If the Contractor fails to clean up to the City’s satisfaction within one business Day, the City may do so and the cost of such clean up shall be charged back to the Contractor.

ARTICLE 24. LAYOUT AND FIELD ENGINEERING

All field engineering required for laying out the Work and establishing grades for earthwork operations shall be furnished by the Contractor at its expense. Layout shall be done by a registered civil engineer or licensed land surveyor acceptable to the City. Any required “as-built” drawings of civil engineering elements of the Work shall be prepared by the registered civil engineer.

ARTICLE 25. EXCESSIVE NOISE

a. The Contractor shall use only such equipment on the Work and in such state of repair so that the emission of sound therefrom is within the noise tolerance level of that equipment as established by CAL-OSHA.

b. The Contractor shall comply with the most restrictive of the following: (1) local sound control and noise level rules, regulations and ordinances and (2) the requirements contained in these Contract Documents, including hours of operation requirements. No internal combustion engine shall be operated on the Work without a muffler of the type recommended by the manufacturer. Should any muffler or other control device sustain damage or be determined to be ineffective or defective, the Contractor shall promptly remove the equipment and shall not return that equipment to the Site until the device is repaired or replaced. Noise and vibration level requirements shall apply to all equipment on the jobsite or related to the Work, including but not limited to, trucks, transit mixers or transit equipment that may or may not be owned by the Contractor.

ARTICLE 26. TESTS AND INSPECTIONS

a. If the Contract Documents, the City, or any instructions, Applicable Law, or public authority require any part of the Work to be tested or approved in writing, Contractor shall provide the City at least two (2) working days’ notice of its readiness for observation or inspection. If inspection is by a public authority other than the City, Contractor shall promptly inform the City of the date fixed for such inspection. Required certificates of inspection (or similar) shall be secured by Contractor. Costs for City testing and City inspection shall be paid by the City.
Costs of tests for Work found not to be in compliance with the Contract Documents or Applicable Law shall be paid by the Contractor.

b. If any Work is done or covered up without the required testing or approval, the Contractor shall uncover or deconstruct the Work, and the Work shall be redone if necessary after completion of the testing in compliance with the Contract Documents, at the Contractor’s cost.

c. Where inspection and testing are to be conducted by an independent laboratory or agency, materials or samples of materials to be inspected or tested shall be selected by such laboratory or agency, or by the City, and not by Contractor. All tests or inspections of materials shall be made in accordance with the commonly recognized standards of national organizations.

d. In advance of manufacture of materials to be supplied by Contractor which must be tested or inspected, Contractor shall notify the City so that the City may arrange for testing at the source of supply. Any materials which have not satisfactorily passed such testing and inspection shall not be incorporated into the Work.

e. If the manufacture of materials to be inspected or tested will occur in a plant or location outside the geographic limits of City, the Contractor shall pay for any excessive or unusual costs associated with such testing or inspection, including but not limited to excessive travel time, standby time and required lodging.

f. Reexamination of Work may be ordered by the City. If so ordered, Work must be uncovered or deconstructed by Contractor. If Work is found to be in accordance with the Contract Documents, the City shall pay the costs of reexamination and reconstruction. If such work is found not to be in accordance with the Contract Documents, Contractor shall pay all costs.

ARTICLE 27. PROTECTION OF WORK AND PROPERTY

a. The Contractor shall be responsible for all damages to persons or property that occur as a result of or in connection with the Work. Contractor shall be responsible for the proper care and protection of all materials delivered and Work performed until completion and final acceptance by the City. All Work shall be solely at the Contractor’s risk. Contractor shall protect adjacent property from settlement or loss of lateral support as necessary, and shall give all notices required by law. Contractor shall comply with all applicable safety laws and building codes to prevent accidents or injury to persons on, about, or adjacent to the Site. Contractor shall erect and properly maintain at all times, as required by field conditions and progress of work, all necessary safeguards, signs, barriers, lights, and watchmen for protection of workers and the public, and shall post danger signs warning against hazards created in the course of construction.
b. In an emergency affecting safety of life or of work or of adjoining property, Contractor, without special instruction or authorization from the City, is hereby permitted to act to prevent such threatened loss or injury; and Contractor shall so act, without appeal, if so authorized or instructed by the City. Any compensation claimed by Contractor on account of emergency work shall be determined by and agreed upon by the City and the Contractor.

c. Contractor shall provide such heat, covering, and enclosures as are necessary to protect all Work, materials, equipment, appliances, and tools against damage by weather conditions.

d. Contractor shall take adequate precautions to protect existing sidewalks, curbs, pavements, utilities, and other adjoining property and structures, and to avoid damage thereto, and Contractor shall repair any damage thereto caused by the Work operations. Contractor shall:

1. Enclose the working area with a substantial barricade and arrange work to cause minimum amount of inconvenience and danger to the public.

2. Provide substantial barricades around any shrubs or trees indicated to be preserved.

3. Deliver materials to the Site over a route designated by the City.

4. Provide any and all dust control required and follow the applicable air quality regulations as appropriate. If the Contractor does not comply immediately with a notice from City or a public agency responsible for air quality, the City shall have the authority to provide dust control and deduct the cost from payments to the Contractor.

5. Confine Contractor’s apparatus, the storage of materials, and the operations of its workers to limits required by law, ordinances, permits, or directions of the City. Contractor shall not unreasonably encumber the Site with its materials.

6. Take care to prevent disturbing or covering any survey markers, monuments, or other devices marking property boundaries or corners. If such markers are disturbed by accident, they shall be replaced by a civil engineer or land surveyor acceptable to City, at no cost to the City.

7. Ensure that existing facilities, fences and other structures are all adequately protected and that, upon completion of all Work, all facilities that may have been damaged are restored to a condition acceptable to the City.

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8. Preserve and protect from injury all buildings, pole lines and all direction, warning and mileage signs that have been placed within the right-of-way.

9. At the completion of work each day, leave the Work and the Site in a clean, safe condition.

10. Comply with any stage construction and traffic handling plans. Access to residences and businesses shall be maintained at all times, except with City’s written approval. Any request for approval to reduce or restrict access to residences and business must be submitted to City at least seven (7) days in advance, and City may issue or withhold approval in its sole discretion.

These precautionary measures will apply continuously and not be limited to normal working hours. Full compensation for the work involved in the protection and preservation of life, safety and property as above specified shall be considered as included in the prices paid for the various contract items of Work, and no additional allowance will be made therefor.

Should damage to persons or property occur as a result of the Work, Contractor shall promptly notify City, in writing. Contractor shall be responsible for proper investigation, documentation, including video or photography, to adequately memorialize and make a record of what transpired. The City shall be entitled to inspect and copy any such documentation, video, or photographs.

Contractor shall maintain all investigation documentation including video and/or photographs for a minimum of four (4) years following completion of the project.

ARTICLE 28. CONTRACTOR’S MEANS AND METHODS

Contractor is solely responsible for the means and methods utilized to perform the Work. In no case shall the Contractor’s means and methods fall below commonly used industry standards.

ARTICLE 29. INSPECTOR’S FIELD OFFICE

a. If required by the City, the Contractor shall be responsible for providing the inspector’s field office. The Office shall be a substantial waterproof construction with adequate natural light and ventilation by means of stock design windows. Door shall have a key type lock or padlock clasp. The office shall have heating and air conditioning and shall be equipped with a telephone, a telephone answering machine, an ability to connect to the internet, and a fax machine at Contractor’s expense.

b. A table satisfactory for the study of plans and two chairs shall be provided by Contractor. Contractor shall provide and pay for adequate electric lights, local
telephone service, and adequate heat and air conditioning for the field office until authorized removal.

ARTICLE 30. AUTHORIZED REPRESENTATIVES

The City shall designate representatives, who shall have the right to be present at the Site at all times. The City may designate an inspector who shall have the right to observe all of the Contractor's Work. The inspector is not authorized to make changes in the Contract Documents. The inspector shall not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. Contractor shall provide safe and proper facilities for such access.

ARTICLE 31. HOURS OF WORK

a. Eight (8) hours of work shall constitute a legal day's work. The Contractor and each subcontractor shall forfeit, as penalty to the City, twenty-five dollars ($25.00) for each worker employed in the execution of Work by the Contractor or any subcontractor for each day during which such worker is required or permitted to work more than eight (8) hours in any one day and forty (40) hours in any week in violation of the provisions of the Labor Code, and in particular, Section 1810 to Section 1815, except as provided in Labor Code Section 1815.

b. Work shall be accomplished on a regularly scheduled eight (8) hour per day work shift, Monday through Saturday, with no Work on City-observed holidays, between the hours of 7:00 a.m. and 7:00 p.m., unless the Contract Documents provide otherwise or unless otherwise approved in writing by the City. Refer to Section 01 11 00 for allowable workdays and hours. Work on Saturday is not allowed without prior permission.

c. It shall be unlawful for any person to operate any lawn mower, backpack blower, lawn edger, riding tractor, or any other machinery, equipment, or other mechanical or electrical device, or any hand tool which creates a loud, raucous or impulsive sound between the hours of 7:00 p.m. and 7:00 a.m. unless otherwise approved in writing by the City.

ARTICLE 32. PAYROLL RECORDS

a. Pursuant to Labor Code Section 1776, the Contractor and each subcontractor shall maintain weekly certified payroll records showing the name, address, social security number, work classification, straight time and overtime hours paid each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker or other employee employed in connection with the work. Contractor shall certify under penalty of perjury that records maintained and submitted by Contractor are true and accurate. Contractor shall also require subcontractor(s) to certify weekly payroll records under penalty of perjury.

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b. In accordance with Labor Code section 1771.4, the Contractor and each subcontractor shall furnish the certified payroll records directly to the Department of Industrial Relations on a weekly basis and in the format prescribed by the Department of Industrial Relations, which may include electronic submission. The Contractor shall also provide the following:

1. A certified copy of the employee’s payroll records shall be made available for inspection or furnished to such employee or his or her authorized representative on request.

2. A certified copy of all payroll records described herein shall be made available for inspection or furnished upon request of the Department of Industrial Relations (“DIR”).

c. The certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement (“DLSE”) of the DIR or shall contain the same information as the forms provided by the DLSE.

d. Any copy of records made available for inspection and furnished upon request to the public shall be marked or obliterated in such a manner as to prevent disclosure of an individual’s name, address, and social security number. The name and address of the Contractor or any subcontractor shall not be marked or obliterated.

e. In the event of noncompliance with the requirements of this Section, the Contractor shall have ten (10) days in which to comply subsequent to receipt of written notice specifying any item or actions necessary to ensure compliance with this section. Should noncompliance still be evident after such ten (10) day period, the Contractor shall, as a penalty to the City, forfeit One Hundred Dollars ($100.00) for each day, or portion thereof, for each worker until strict compliance is effectuated. Upon the request of the DIR, such penalties shall be withheld from contract payments.

ARTICLE 33. PREVAILING RATES OF WAGES

a. The Contractor is aware of the requirements of Labor Code Sections 1720 et seq. and 1770 et seq., as well as California Code of Regulations, Title 8, Section 16000 et seq. (“Prevailing Wage Laws”), which require the payment of prevailing wage rates and the performance of other requirements on certain “public works” and “maintenance” projects. Since this Work involves an applicable “public works” or “maintenance” project, as defined by the Prevailing Wage Laws, and since the total compensation is $1,000 or more, Contractor agrees to fully comply with such Prevailing Wage Laws. The Contractor shall obtain a copy of the prevailing rates of per diem wages at the commencement of this Agreement from the website of the Division of Labor Statistics and Research of the Department of Industrial Relations located at www.dir.ca.gov/dlfr/. In the alternative, the
Contractor may view a copy of the prevailing rates of per diem wages at the City. Contractor shall make copies of the prevailing rates of per diem wages for each craft, classification or type of worker needed to perform the Work available to interested parties upon request, and shall post copies at the Contractor’s principal place of business and at the Site. Contractor shall defend, indemnify and hold the City, its elected officials, officers, employees and agents free and harmless from any claims, liabilities, costs, penalties or interest arising out of any failure or allege failure to comply with the Prevailing Wage Laws.

b. The Contractor and each subcontractor shall forfeit as a penalty to the City not more than two hundred dollars ($200.00) for each calendar day, or portion thereof, for each worker paid less than the stipulated prevailing wage rate for any work done by him, or by any subcontract under him, in violation of the provisions of the Labor Code. The difference between such stipulated prevailing wage rate and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the stipulated prevailing wage rate shall be paid to each worker by the Contractor.

c. Contractor shall post, at appropriate conspicuous points on the Site, a schedule showing all determined general prevailing wage rates and all authorized deductions, if any, from unpaid wages actually earned.

d. Pursuant to Labor Code sections 1725.5 and 1771.1, all contractors and subcontractors that wish to bid on, be listed in a bid proposal, or enter into a contract to perform public work must be registered with the Department of Industrial Relations. No bid will be accepted nor any contract entered into without proof of the contractor’s and subcontractors’ current registration with the Department of Industrial Relations to perform public work. This Project will be subject to compliance monitoring and enforcement by the Department of Industrial Relations. Contractor shall comply with all requirements and regulations from the Department of Relations relating to labor compliance monitoring and enforcement.

e. The Contractor shall have an affirmative obligation to verify that all subcontractors are currently and validly registered with the Department of Industrial Relations and shall not permit a subcontractor of any tier to perform work on the project without first verifying the subcontractor’s registration. The Contractor shall include the requirements of Labor Code sections 1725.5 and 1771.1 in its contracts with subcontractors and ensure that all subcontractors are registered at the time of bid opening and maintain valid registration for the duration of the project.
ARTICLE 34. EMPLOYMENT OF APPRENTICES

The Contractor's attention is directed to the provisions of Sections 1777.5, 1777.6, and 1777.7 of the Labor Code concerning employment of apprentices by the Contractor or any subcontractor. The Contractor shall obtain a certificate of apprenticeship before employing any apprentice pursuant to Section 1777.5, 1777.6, and 1777.7 of the Labor Code. Information relative to apprenticeship standards, wage schedules, and other requirements may be obtained from the Director of Industrial Relations, the Administrator of Apprenticeships, San Francisco, California, or from the Division of Apprenticeship Standards and its branch offices.

ARTICLE 35. NONDISCRIMINATION/EQUAL EMPLOYMENT OPPORTUNITY/EMPLOYMENT ELIGIBILITY

a. No Discrimination. Pursuant to Labor Code Section 1735 and other applicable provisions of law, the Contractor and its subcontractors shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, age, political affiliation, marital status, or handicap on this Work. The Contractor will take affirmative action to insure that employees are treated during employment or training without regard to their race, color, religion, sex, national origin, age, political affiliation, marital status, or handicap.

b. Employment Eligibility; Contractor. By executing this Contract, Contractor verifies that it fully complies with all requirements and restrictions of state and federal law respecting the employment of undocumented aliens, including, but not limited to, the Immigration Reform and Control Act of 1986, as may be amended from time to time. Such requirements and restrictions include, but are not limited to, examination and retention of documentation confirming the identity and immigration status of each employee of the Contractor. Contractor also verifies that it has not committed a violation of any such law within the five (5) years immediately preceding the date of execution of this Contract, and shall not violate any such law at any time during the term of the Contract. Contractor shall avoid any violation of any such law during the term of this Contract by participating in an electronic verification of work authorization program operated by the United States Department of Homeland Security, by participating in an equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, or by some other legally acceptable method. Contractor shall maintain records of each such verification, and shall make them available to the City or its representatives for inspection and copy at any time during normal business hours. The City shall not be responsible for any costs or expenses related to Contractor’s compliance with the requirements provided for in this Article or any of its sub-sections.
c. **Employment Eligibility; Subcontractors, Sub-subcontractors and Consultants.** To the same extent and under the same conditions as Contractor, Contractor shall require all of its subcontractors, sub-subcontractors and consultants performing any part of the Work or of this Contract to make the same verifications and comply with all requirements and restrictions provided for in this Article.

d. **Employment Eligibility; Failure to Comply.** Each person executing this Contract on behalf of Contractor verifies that he or she is a duly authorized officer of Contractor, and understands that any of the following shall be grounds for the City to terminate the Contract for cause: (1) failure of Contractor or its subcontractors, sub-subcontractors or consultants to meet any of the requirements provided for in this Article; (2) any misrepresentation or material omission concerning compliance with such requirements (including in those verifications provided to the Contractor under this Article; or (3) failure to immediately remove from the Work any person found not to be in compliance with such requirements.

**ARTICLE 36. LABOR/EMPLOYMENT SAFETY**

The Contractor shall maintain emergency first aid treatment for its employees which complies with the Federal Occupational Safety and Health Act of 1970 (29 U.S.C. § 651 et seq.), and California Code of Regulations, Title 8, Industrial Relations Division 1, Department of Industrial Relations, Chapter 4.

**ARTICLE 37. INSURANCE**

1. **Requirement.** In accordance with this Article and any applicable Special Conditions or other requirements of these Contract Documents, Contractor shall procure and maintain for the duration of the Contract and any extensions thereof, and for 3 years thereafter, insurance against claims for injuries to persons or damages to property that may arise from or in connection with the performance of the Work hereunder by the Contractor, his agents, representatives, employees, or subcontractors.

2. **Minimum Scope and Limit of Insurance.** Coverage shall be at least as broad as:

   1. **Commercial General Liability (CGL):** Contractor shall, at Contractor’s sole cost and expense and throughout the term of this Agreement, and any extensions thereof, carry Commercial General Liability (CGL) insurance coverage at least as broad as Insurance Services Office Form CG 00 01 in an amount not less than $2,000,000 per occurrence, $4,000,000 general aggregate for bodily injury, personal injury and property damage,
including without limitation, blanket contractual liability; and a $4,000,000 completed operations aggregate.

2. **Automobile Liability**: Contractor shall, at Contractor's sole cost and expense and throughout the term of this Agreement, and any extensions thereof, carry automobile insurance at least as broad as Insurance Services Office Form Number CA 00 01, covering bodily injury and property damage for all activities of the Contractor arising out of in connection with the work to be performed under this Agreement, including coverage of any owned, hired, non-owned or rented vehicles, in an amount not less than $1,000,000 combined single limit for each accident.

3. **Workers' Compensation**: Contractor shall, at Contractor's sole cost and expense and throughout the term of this Agreement, and any extensions thereof, carry Workers' Compensation Insurance (Statutory Limits) and Employers’ Liability Insurance with limits of at least $1,000,000 per accident for bodily injury or disease, for contractor's employees as required by the laws of the State of California. Contractor shall submit to the City, along with the certificate of insurance, a Waiver of Subrogation, endorsement in favor of the City, its officers, agents, employees and volunteers.

4. **Builder's Risk (Course of Construction)**: Contractor shall, at Contractor's sole cost and expense and throughout the term of this Agreement, and any extensions thereof, carry and maintain Builder’s Risk insurance as specified below.

The named insureds shall be Contractor, all Subcontractors (excluding those solely responsible for design work) of any tier, suppliers, and City, its officers, officials, agents, employees and volunteers. Contractor shall not be required to maintain property insurance for any portion of the Project following transfer of control thereof to City.

Policy shall be provided for replacement value on an “All Risk” (Special Perils) coverage form, with limits equal to the completed value of the project and no coinsurance penalty provisions. Policy must include: (1) coverage for any ensuring loss from faulty workmanship, nonconforming work, omission or deficiency in design or specifications; (2) coverage against machinery accidents and operational testing; (3) coverage for removal of debris, and insuring the buildings, structures, machinery, equipment, materials, facilities, fixtures and all other properties constituting a part of the project; (4) transit coverage, including ocean marine coverage (unless insured by the supplier), with sub-limits sufficient to insure the full replacement value of any key equipment item; and (5) coverage with sub-limits sufficient to insure the full replacement value of
any property or equipment stored either on or off the site. Such insurance shall be on a form acceptable to the City to ensure adequacy of terms and sublimits.

Contractor may submit evidence of Builder’s Risk insurance in the form of Course of Construction coverage. Such coverage shall name the City as a loss payee as their interest may appear.

If Contractor maintains higher limits than the minimums shown above, the City requires and shall be entitled to coverage for the higher limits maintained by the Contractor. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the City.

3. **Other Insurance Provisions.** The insurance policies are to contain, or be endorsed to contain, the following provisions:

1. **Additional Insureds.** The City, its officers, officials, agents, employees, and volunteers are to be covered as additional insureds on the CGL policy with respect to liability arising out of work or operations performed by or on behalf of the Contractor including materials, parts, or equipment furnished in connection with such work or operations. General liability coverage can be provided in the form of an endorsement to the Contractor’s insurance (at least as broad as ISO Form CG 20 38 04 13 AND CG 20 10, CG 11 85 or both CG 20 10 and CG 20 37 forms if later revisions used).

2. **City’s Rights of Enforcement**

   In the event any policy of insurance required under this Agreement does not comply with these specifications or is cancelled and not replaced, City has the right but not the duty to obtain the insurance it deems necessary and any premium paid by the City will be promptly reimbursed by Contractor, or City will withhold amounts sufficient to pay premium from Contractor payments. In the alternative, City may cancel this Agreement.

3. **City’s Right to Revise Specifications**

   The City reserves the right at any time during the term of the Agreement to change the amounts and types of insurance required by giving the Contractor ninety (90) days advance written notice of such change. If such change results in substantial additional cost to the Contractor, the City and Contractor may renegotiate Contractor’s compensation.

4. **Primary and Non-Contributory Coverage.** For any claims related to this Project, the Contractor’s insurance coverage shall be primary insurance as respects the City, its officers, officials, agents, employees, and

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volunteers. Any insurance or self-insurance maintained by the City, its officers, officials, employees, or volunteers shall be excess of the Contractor’s insurance and shall not contribute with it; and shall be at least as broad as CG 20 01 04 13.

5. Notice of Cancellation. Each insurance policy required by this clause shall provide that coverage shall not be cancelled, except with notice to the City.

6. Deductibles and Self-Insured Retentions. Any deductibles or self-insured retentions must be declared to and approved by the City. At the option of the City, either: (1) the Contractor shall cause the insurer to reduce or eliminate such deductibles or self-insured retentions as respects the City, its officers, officials, employees, and volunteers; or (2) the Contractor shall provide a financial guarantee satisfactory to the City guaranteeing payment of losses and related investigations, claim administration, and defense expenses.

7. Acceptability of Insurers. All insurance policies shall be issued by an insurance company currently authorized by the Insurance Commissioner to transact business of insurance in the State of California, with a current A.M. Best’s rating of no less than A:VII, (unless otherwise acceptable to the City).

8. Waiver of Subrogation. All insurance coverage maintained or procured pursuant to this Agreement shall be endorsed to waive subrogation against the City, its officers, officials, agents, employees or volunteers or shall specifically allow Contractor - or others providing insurance evidence in compliance with these specifications - to waive their right of recovery prior to a loss. Contractor hereby waives his own right of recovery against City, and shall require similar written express waivers and insurance clauses from each of its subcontractors. Copies of these waivers shall be submitted to the City prior to commencement of work.

9. Claims Made Policies. If any coverage required is written on a claims-made coverage form:

1. The retroactive date must be shown, and this date must be before the execution date of the Contract or the beginning of the Work.

2. Insurance must be maintained and evidence of insurance must be provided for at least five (5) years after completion of the Work.

3. If coverage is cancelled or non-renewed, and not replaced with another claims-made policy form with a retroactive date prior to the
Contract being effective, or start of work date, the Contractor must purchase extended reporting period coverage for a minimum of five (5) years after completion of the Work.

4. A copy of the claims reporting requirements must be submitted to the City for review.

5. If the services involve lead-based paint or asbestos identification/remediation, the Contractor's Pollution Liability policy shall not contain lead-based paint or asbestos exclusions. If the services involve mold identification/remediation, the Contractor's Pollution Liability policy shall not contain a mold exclusion, and the definition of Pollution shall include microbial matter, including mold.

10. **Verification of Coverage.** Contractor shall provide City with copies of certificates (on City certificate form or an Accord form as modified per City direction) for all policies, with the appropriate named additional insured coverage and an endorsement that they are not subject to cancellation without 30 days prior written notice to City. All certificates and endorsements are to be received and approved by the City before work commences. However, failure to obtain the required documents prior to the work beginning shall not waive the Contractor's obligation to provide them. The City reserves the right to require complete, certified copies of all required insurance policies, including endorsements required by these specifications, at any time.

11. **Subcontractors.** Contractor shall require and verify that all subcontractors maintain insurance meeting all the requirements stated herein, and Contractor shall ensure that City is an additional insured on insurance required from subcontractors. For CGL coverage, subcontractors shall provide coverage with a form at least as broad as CG 20 38 04 13.

12. **Products/completed operations coverage** shall extend a minimum of three years after the project completion. Coverage shall be included on behalf of the insured for covered claims arising out of the actions of independent contractors. If the insured is using subcontractors, the Policy must include work performed “by or on behalf” of the insured. Policy shall contain no language that would invalidate or remove the insurer’s duty to defend or indemnify for claims or suits expressly excluded from coverage. Policy shall specifically provide for a duty to defend on the part of the insurer. The City, its officers, officials, agents’ employees, and volunteers shall be included as insureds under the policy.
ARTICLE 38.  TIME FOR COMPLETION AND LIQUIDATED DAMAGES

a. Time for Completion/Liquidated Damages. The Contract Time(s) set forth in Article 2 of the Contract for Construction shall commence: (1) on the date stated in the Notice to Proceed, or (2) if the Notice to Proceed does not specify a commencement date, then on the date of the Notice to Proceed. All Work shall be completed by the Contractor within the Contract Time(s). If the Work is not completed within the Contract Time(s), it is understood that the City will suffer damage, and that it is and will be difficult and/or impossible to ascertain and determine the actual damage which the City will sustain in the event of and by reason of the Contractor’s failure to complete the Work within the Contract Time(s). In accordance with Government Code section 53069.85, it is agreed that Contractor shall pay to the City as fixed and liquidated damages, and not as a penalty, the sum stipulated in the Contract for each day of delay until the Work is fully completed. Contractor and its surety shall be liable for any liquidated damages. Any money due or to become due the Contractor may be retained to cover liquidated damages.

b. Inclement Weather. Contractor shall be bound by the City’s determination of what constitutes inclement weather. Time extensions for inclement weather shall only be granted when the Work stopped during inclement weather is on the critical path of the Work schedule.

c. Extension of Time. Contractor shall not be charged liquidated damages because of any delays in completion of the Work due to unforeseeable causes beyond the control and without the fault or negligence of Contractor (or its subcontractors or suppliers). Contractor shall within seven (7) Days of identifying any such delay notify the City in writing of causes of delay. The City shall ascertain the facts and extent of delay and grant extension of time for completing the Work when, in its judgment, the facts justify such an extension. Time extensions to the Work shall be requested by the Contractor as they occur and without delay. No delay claims shall be permitted unless the event or occurrence delays the completion of the Work beyond the Contract completion date.

d. Reverse Liquidated Damages. Consistent with Public Contract Code Section 7102, Contractor will be compensated for damages incurred due to delays for which the City is responsible. The parties agree that determining Contractor’s exact delay damages are and will continue to be impracticable and extremely difficult. As such, for each calendar day in excess of the Contract Time(s) set forth in Article 2 of the Contract for Construction, the City shall pay to the Contractor the sum stipulated in the Contract per day. Such amount shall constitute the only payment allowed for any City caused delays and shall necessarily include all overhead, all profits, all administrative costs, all bond costs, all labor, materials, equipment and rental costs and any other costs, expenses and fees incurred or sustained as a result of such delays. Notice of
requests for delay damages and additional days shall be provided to the City within seven (7) days from the discovery date of the underlying facts and circumstances that gave rise to the delay.

ARTICLE 39. COST BREAKDOWN AND PERIODIC ESTIMATES

Contractor shall furnish on forms approved by the City:

a. Within ten (10) Days of award of the Contract a detailed Schedule of Values giving an itemized breakdown of the Contract Price; the Schedule of Values shall be adjusted as directed by City.

b. A monthly itemized estimate of Work done for the purpose of making progress payments. In order for the City to consider and evaluate each progress payment application, the Contractor shall submit a detailed measurement of Work performed and a progress estimate of the value thereof before the tenth (10th) Day of the following month.

c. Contractor shall submit, with each of its payment requests, an adjusted list of actual quantities, to be verified by the City, for unit price items listed, if any, in the Bid Form.

d. Following the City’s acceptance of the Work, the Contractor shall submit to the City a written statement of the final quantities of unit price items for inclusion in the final payment request.

e. The City shall have the right to adjust any estimate of quantity and to subsequently correct any error made in any estimate for payment.

Contractor shall certify under penalty of perjury, that all cost breakdowns and periodic estimates accurately reflect the Work.

ARTICLE 40. MOBILIZATION

a. When the Bid Form includes a bid item for mobilization, the costs of Work in advance of construction operations and not directly attributable to any specific bid item will be included in the progress estimate as “Mobilization”. When no bid item is provided for “Mobilization,” payment for such costs will be deemed to be included in the other items of the Work.

b. Payment for Mobilization shall be based on the lump sum provided in the Bid Form, which shall constitute full compensation for all such Work. The lump sum amount for Mobilization shall not exceed five percent (5%) of the total amount of the bid, unless the bid documents indicate otherwise. No payment for Mobilization will be made until all of the items listed below have been completed.

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to the satisfaction of the City. The scope of the Work included under Mobilization shall include, but shall not be limited to, the following principal items:

1. Obtaining, paying for and delivering to the City all bonds, insurance, and permits.

2. Moving on to the Site all Contractor’s plant and equipment required for the first month’s operations.

3. Installing temporary construction power, wiring, and lighting facilities.

4. Establishing a fire protection system.

5. Developing and installing a construction water supply.

6. Submittal and approval of all preliminary site videos, photographs and any other existing condition surveys as required per Section 0132 19 Submittals.

7. Submittal and approval of the detailed list of submittals and shop drawings, and any other submittals as required in Specification 01 32 19 Submittals.

8. Providing and maintaining the field office trailers for the Contractor and the City, complete with all specified furnishings and utility services including telephones, computer and printer, and copying machines.

9. Providing on-site communication facilities for the Owner and the City, including telephones, Wi-Fi and/or internet connection.

10. Providing on-site sanitary facilities and potable water facilities as specified per Cal-OSHA and these Contract Documents.

11. Furnishing, installing, and maintaining all storage buildings or sheds required for temporary storage of products, equipment, or materials that have not yet been installed in the Work. All such storage shall meet manufacturer’s specified storage requirements, and specific provisions of the specifications, including temperature and humidity control, if recommended by the manufacturer, and for all security.

12. Arranging for and erection of Contractor’s work and storage yard per Section 01 55 00 entitled “Site Access and Parking.”

13. Posting all OSHA required notices and establishment of safety programs per Cal-OSHA.

14. Full-time presence of Contractor’s superintendent at the Site as required herein in Article 11.

15. Furnishing and Erecting the Project Identification Sign(s), as required by the Section Titled “Project Identification”.

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16. Submittal and approval of the Initial Construction Schedule as required by the Contract Documents, including all necessary revisions.


18. Submittal and approval of the Contractor’s Injury and Illness Prevention Program.

ARTICLE 41. PAYMENTS

a. The City shall make monthly progress payments following receipt of undisputed and properly submitted payment requests. Unless otherwise specified in the Notice, Contractor shall be paid a sum equal to ninety five percent (95%) of the value of Work performed up to the last day of the previous month, less the aggregate of previous payments.

1. In the event City disputes all or a portion of any payment request, City shall pay the undisputed portion and return the payment request to the Contractor for revision and resubmittal of the disputed portion. Any dispute related to a payment request shall not relieve or excuse Contractor from its duty to proceed with the Work and complete the Work within the Contract Time.

b. The Contractor shall, after the full completion of the Work, submit a final payment application. All prior progress estimates shall be subject to correction in the final estimate and payment.

c. Unless otherwise required by law, the final payment of five percent (5%) of the value of the Work, if unencumbered, shall be paid no later than sixty (60) Days after the date of recordation of the Notice of Completion.

d. Acceptance by Contractor of the final payment shall constitute a waiver of all claims against the City arising from this Contract.

e. Payments to the Contractor shall not be construed to be an acceptance of any defective work or improper materials, or to relieve the Contractor of its obligations under the Contract Documents.

f. The Contractor shall submit with each payment request the Contractor's conditional waiver of lien for the entire amount covered by such payment request, as well as a valid unconditional waiver of lien from the Contractor and all subcontractors and materialmen for all work and materials included in any prior invoices. Waivers of lien shall be in the forms prescribed by California Civil Code Sections 8132, 8134, 8136, and 8138. Prior to final payment by the City, the Contractor shall submit a final conditional waiver of lien for the Contractor’s work, together with unconditional releases of lien from any subcontractor or
materialmen for all previous payments and conditional releases for any remaining payments.

ARTICLE 42. PAYMENTS WITHHELD AND BACKCHARGES

In addition to amounts which the City may retain under other provisions of the Contract Documents the City may withhold payments due to Contractor as City may consider appropriate to protect City from any of the following:

a. Stop Notice Claims.

b. Defective work not remedied.

c. Failure of Contractor to make proper payments to its subcontractors or suppliers.

d. Completion of the Contract if there exists a reasonable doubt that the work can be completed for balance then unpaid.

e. Damage to another contractor or third party.

f. Amounts which may be due the City for claims against Contractor.

g. Failure of Contractor to keep the record (“as-built”) drawings up to date.

h. Failure to provide updates on the construction schedule.

i. Site clean up.

j. Failure of the Contractor to comply with requirements of the Contract Documents.

k. Liquidated damages.

l. Legally permitted penalties.

Upon completion of the Contract, the City will reduce the final Contract Price to reflect costs charged to the Contractor, back charges or payments withheld pursuant to the Contract Documents.

ARTICLE 43. CHANGES AND EXTRA WORK

a. Work Directive Change. City and/or the Engineer may direct changes in the Work by issuing a Work Directive given in writing to Contractor's representative or on-site superintendent or foreman in charge of the particular Work for which the Work Directive is given. A Work Directive shall describe the work to be undertaken and any change in the Work. A Work Directive shall only be used when the Work to be added or deleted must be accomplished before the Change Order procedure can be accomplished. THE CONTRACT PRICE AND

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CONTRACT TIME MAY ONLY BE ADJUSTED BY CHANGE ORDER AND MAY NOT BE ADJUSTED BY WORK DIRECTIVE. TO THE EXTENT THE WORK DIRECTIVE RESULTS IN A CHANGE TO THE CONTRACT PRICE OR THE CONTRACT TIME, CONTRACTOR MUST TIMELY REQUEST A CHANGE ORDER AND COMPLY WITH ALL CHANGE ORDER PROCEDURES IN ACCORDANCE WITH THIS ARTICLE. Notwithstanding issuance of a Work Directive, failure to timely request a Change Order shall constitute a waiver by Contractor of any adjustment to the Contract Price or Contract Time for the Work performed under the Work Directive. City shall not be liable to Contractor for Work performed or omitted by Contractor in reliance on verbal orders.

b. **Change Order Work.** The City, without invalidating the Contract, may order changes in the Work consisting of additions, deletions or other revisions, and the Contract Price and Contract Time shall be adjusted accordingly. All such changes in the Work shall be authorized by Change Order, and shall be performed under the applicable conditions of the Contract Documents. A Change Order signed by the Contractor indicates the Contractor’s agreement therewith, including any adjustment in the Contract Price or the Contract Time, and the full and final settlement of all costs (direct, indirect and overhead) related to the Work authorized by the Change Order.

All requests for additional compensation to the Contractor shall be presented in writing before the expense is incurred and will be adjusted as provided herein. No work shall be allowed to lag pending such adjustment, but shall be promptly executed as directed, even if a dispute arises. No request for a change will be considered after the work in question has been done unless a written contract change order has been issued or a timely written notice of change or delay has been made by Contractor. Contractor shall not be entitled to claim or to bring suit for damages, whether for loss of profits or otherwise, on account of any decrease or omission of any item or portion of Work to be done. Whenever any change is made as provided for herein, such change shall be considered and treated as though originally included in the Contract, and shall be subject to all terms, conditions and provisions of the original Contract.

c. **Notice Of Delay Or Change.** With respect to any matter that may involve or require an adjustment to the Contract Time or the Contract Price, Contractor shall provide written notice of the underlying facts and circumstances that gave rise to the proposed change, within the following times:

1. If due to unknown subsurface or latent physical conditions, within three (3) days from the discovery date or prior to the alterations of the conditions, whichever is earlier.

2. If due to any other matter that may involve an adjustment to the Contract Time or the Contract Price, within seven (7) days from the discovery date.
d. **Request For Extension Or Change.** Within twenty-one (21) days from providing the notice of delay or change, and prior to incurring any expense, Contractor shall submit a Change Order Request. The Change Order Request shall identify the amount of the adjustment to the Contract Price or the Contract Time, or both.

The Change Order Request shall contain all supporting documentation for the proposed changes, including but not limited to data showing the hours worked, cost estimates, invoices, and schedules. If the Change Order Request includes a request for an extension of the Contract Time, the Change Order Request shall include a time impact analysis showing the impact of the underlying facts and circumstances to the critical path. City may request, and Contractor shall provide, any additional information supporting the Change Order Request, including but not limited to native electronic format version of schedules and time impact analyses.

If any added costs or information cannot be determined at the time of the Change Order Request, Contractor shall identify the reason the costs or information cannot be determined. For any costs or information that cannot be determined at the time Contractor submits the Change Order Request, Contractor shall submit to City notice of the costs or information and all supporting documentation within three (3) days of when the costs or information become subject to determination.
e. WAIVER OF RIGHTS OF CONTRACTOR.

FAILURE BY CONTRACTOR TO PROVIDE TIMELY NOTICE AND REQUEST WHERE SUCH NOTICE AND REQUEST IS REQUIRED BY THIS ARTICLE SHALL CONSTITUTE A WAIVER BY CONTRACTOR OF THE RIGHT TO A CONTRACT ADJUSTMENT ON ACCOUNT OF SUCH CIRCUMSTANCES AND A WAIVER OF ANY RIGHT TO FURTHER RECURSCE OR RECOVERY BY REASON OF OR RELATED TO SUCH CHANGE BY MEANS OF THE CLAIMS DISPUTE RESOLUTION PROCESS OR BY ANY OTHER LEGAL PROCESS OTHERWISE PROVIDED FOR UNDER APPLICABLE LAWS.

f. Whenever possible, any changes to the Contract Price shall be in a lump sum mutually agreed by the Contractor and the City.

g. Price quotations from the Contractor shall be accompanied by such detailed supporting documentation, including but not limited to estimates and quotations from subcontractors or material suppliers, as City may reasonably request.

h. If the Contractor fails to submit a complete cost proposal within the twenty-one (21) Day period (or as requested), the City has the right to order the Contractor in writing to commence the work immediately on a force account basis and/or issue a lump sum change to the Contract Price in accordance with the City’s estimate of cost. If the change is issued based on the City estimate, the Contractor will waive its right to dispute the action unless within fifteen (15) Days following receipt of the City’s estimate, the Contractor presents written proof that the City’s estimate was in error.

i. Estimates for lump sum quotations and accounting for cost-plus-percentage work shall be limited to direct expenditures necessitated specifically by the extra work, and shall be segregated as follows:

1. **Labor.** The costs of labor will be the actual cost for wages prevailing locally for each craft or type of worker at the time the extra work is done, plus employer payments of payroll taxes and insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State or local laws, as well as assessment or benefits required by lawful collective bargaining agreements. The use of a labor classification which would increase the extra work cost will not be permitted unless the Contractor establishes the necessity for such additional costs. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.

2. **Materials.** The cost of materials reported shall be at the lowest current price at which such materials are locally available in the quantities involved, plus sales tax, freight and delivery. Materials costs shall be

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based upon supplier or manufacturer’s invoice. If invoices or other satisfactory evidence of costs are not furnished within the time required for requesting a change of the Contract Price or Contract Time, then the City may determine the materials cost, at its sole discretion, or may determine that the Contractor waived all rights to payment for material costs pursuant to Section 5 of this Article.

3. Tool and Equipment Use. Regardless of ownership, the rates to be used in determining equipment use shall not exceed listed rates prevailing locally at equipment rental agencies, or distributors, at the time the work is performed. The Contractor shall furnish cost data supporting the establishment of the rental rate. The rental rate to be applied for use of each items of equipment shall be the rate resulting in the least total cost to the City for the total period of use. The City shall the make the final determination as to an equitable rental rate for the equipment. No payment will be made for the use of small tools, which have a replacement value of $1,000 or less.

i. The rental time to be paid for equipment shall be the time the equipment is in productive operation on the extra work being performed. Rental time will not be allowed while equipment is inoperative due to breakdowns.

ii. All equipment shall, in the opinion of the City, be in good working condition and suitable for the purpose for which the equipment is to be used. Equipment with no direct power unit shall be powered by a unit of at least the minimum rating recommended by the manufacturer.

iii. Before construction equipment is used on any extra work, the Contractor shall plainly stencil or stamp an identifying number thereon at a conspicuous location, and shall furnish to the City, in duplicate, a description of the equipment and its identifying number.

iv. When hourly rates are listed, any part of an hour less than 30 minutes of operation shall be considered to be 1/2-hour of operation, and any part of an hour greater than 30 minutes will be considered one hour of operation. When daily rates are listed, any part of a day less than 4 hours operation shall be considered to be 1/2-day of operation.

4. Allowed Mark-up. The allowed mark-up for any and all overhead (including supervision and home and field office costs) and profit on work added to the Contract shall be determined in accordance with the following provisions:

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i. “Net Cost” is defined as the actual costs of labor, materials and tools and equipment only, excluding overhead and profit. The costs of applicable insurance and bond premium will be reimbursed to the Contractor and subcontractors at cost only, without mark-up. Contractor shall provide City with documentation of the costs, including but not limited to payroll records, invoices, and such other information as City may reasonably request.

ii. For Work performed by the Contractor’s forces the allowed mark-up shall not exceed fifteen (15%) percent of Labor costs, ten percent (10%) of Material costs, and ten percent (10%) of the cost of Tools and Equipment use.

iii. For Work performed by a subcontractor or sub-subcontractor, the allowed mark-up shall not exceed ten (10%) percent of the subcontractor’s or sub-subcontractor’s Net Cost of the Work.

j. For added or deducted Work by subcontractors, the Contractor shall furnish to the City the subcontractor’s signed detailed records of the cost of labor, material and equipment, including the subcontractor markup for overhead and profit. The same requirement shall apply to sub-subcontractors.

k. For added or deducted work furnished by a vendor or supplier, the Contractor shall furnish to the City a detailed record of the cost to the Contractor, signed by such vendor or supplier.

l. Contractor shall not be entitled to any compensation for Work subject to a change order except as expressly set forth in this Article. The mark-up added in instances of extra or additional work shall constitute the entire amount of profit, any mark-ups, any field or home office overhead costs, including personnel, equipment or office space, any materials, or any costs of equipment idle time for such work.

m. Contractor shall not reserve a right to assert impact costs, extended job site costs, extended overhead, constructive acceleration and/or actual acceleration beyond what is stated in the Change Order. No claims shall be allowed for impact, extended overhead costs, constructive acceleration and/or actual acceleration due to a multiplicity of changes and/or clarifications. The Contractor may not change or modify the City’s Change Order form in an attempt to reserve additional rights.

n. If the City disagrees with the proposal submitted by Contractor, it will notify the Contractor, and the City will provide its opinion of the appropriate price and/or time extension. If the Contractor agrees with the City, a change order will be issued by the City. If no agreement can be reached, the City shall have the right to issue a unilateral change order setting forth its determination of the reasonable

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additions or savings in costs and time attributable to the extra or deleted work. Such determination shall become final and binding if the Contractor fails to submit a claim in writing to the City within fifteen (15) Days of the issuance of the unilateral change order, disputing the terms of the unilateral change order and providing such supporting documentation for its position as the City may reasonably require.

o. No dispute, disagreement or failure of the parties to reach agreement on the terms of the Change Order shall relieve the Contractor from the obligation to proceed with performance of the changed work, including extra work, promptly and expeditiously.

p. Any alterations, extensions of time, extra work, deductions in work, or any other changes may be made without securing consent of the Contractor's surety or sureties.

ARTICLE 44. OCCUPANCY

The City reserves the right to occupy or utilize any portion of the Work at any time before completion, and such occupancy or use shall not constitute acceptance of any part of Work covered by this Contract. This use shall not relieve the Contractor of its responsibilities under the Contract.

ARTICLE 45. INDEMNIFICATION FOR THIRD PARTY CLAIMS

To the fullest extent allowed by law, Contractor shall defend (with counsel of City's choosing), indemnify and hold the City, its officials, officers, agents, employees, and representatives free and harmless from any and all third party claims, demands, causes of action, costs, expenses, liabilities, losses, damages or injuries, in law or in equity, to property or persons, including wrongful death, regardless of whether the allegations are false, fraudulent, or groundless, arising out of or incident to any acts, omissions or willful misconduct of Contractor, its officials, officers, employees, agents, consultants and subcontractors, arising out of or in connection with the Work or this Contract, including claims made by subcontractors for nonpayment (“Third Party Claims”). Contractor shall defend, at Contractor's own cost, expense and risk, with counsel of City's choosing, any and all such suits, actions or other legal proceedings of every kind that may be brought or instituted against City, its officials, officers, agents, employees and representatives pertaining to such Third Party Claims. The only limitations on this provision shall be those imposed by Civil Code Section 2782 et seq.

ARTICLE 46. RECORD (“AS BUILT”) DRAWINGS

a. Contractor shall prepare and maintain a complete set of record drawings (herein referred to as “as-builts”) and shall require each trade to prepare its own as-builts. The as-builts must show the entire site for each major trade, including but not limited to water, sewer, electrical, data, telephone, cable, fire alarm, gas and

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plumbing. Contractor shall mark the as-built drawings to show the actual installation where the installation varies from the Work as originally shown in the Contract Documents. Contractor shall mark whichever drawings are most capable of showing conditions fully. Where shop drawings are used, Contractor must record a cross-reference to the corresponding location on the contract drawings. Contractor shall give particular attention to concealed elements that would be difficult to measure, locate or record at a later date. Contractor shall use colors to distinguish separate categories of the Work.

b. Contractor shall note related change order numbers where applicable. Contractor shall organize as-builts into manageable sets, bound with durable paper cover sheets and shall print suitable title, dates and other identification on the cover of each set. Contractor to also provide an electronic version of the as-builts. The suitability of the as-builts will be determined by the City.

ARTICLE 47. RESOLUTION OF DISPUTED CONSTRUCTION CLAIMS

a. Contractor shall timely comply with all notices and requests for changes to the Contract Time or Contract Price, including but not limited to all requirements of Article 43, Changes and Extra Work, as a prerequisite to filing any claim governed by this Article. The failure to timely submit a notice of delay or notice of change, or to timely request a change to the Contract Price or Contract Time, or to timely provide any other notice or request required by this agreement shall constitute a waiver of the right to procedures of this Article.

b. Effective January 1, 1991, Section 20104 et seq., of the California Public Contract Code prescribes a process utilizing informal conferences, non-binding judicial supervised mediation, and judicial arbitration to resolve disputes on construction claims of $375,000 or less.

c. Effective January 1, 2017, Section 9204 of the Public Contract Code prescribes a process for negotiation and mediation to resolve disputes on construction claims. The intent of this Article is to implement Sections 20104 et seq. and Section 9204 of the California Public Contract Code. This Article shall be construed to be consistent with said statutes.

d. For purposes of this Article, “Claim” means a separate demand by the Contractor, after a change order duly requested in accordance with Article 43 “Changes and Extra Work” has been denied, for (A) a time extension, (B) payment of money or damages arising from work done by or on behalf of the Contractor pursuant to the Contract for a public work and payment of which is not otherwise entitled to, or (C) an amount the payment of which is disputed by the City.

e. Claims governed by this Article may not be filed unless and until the Contractor completes all procedures for giving notice of delay or change
and for the requesting of a time extension or change order, including but not necessarily limited to the procedures contained in Article 43 “Changes and Extra Work,” and Contractor’s request for a change has been denied in whole or in part. Claims governed by this Article must be filed no later than the date of final payment.

f. The claim shall be submitted in writing to the City Engineer and shall include on its first page the following in 16 point capital font: “THIS IS A CLAIM.” Furthermore, the claim shall include the documents necessary to substantiate the claim. Nothing in this subdivision is intended to extend the time limit or supersede notice requirements otherwise provided by contract for the filing of claims, including all requirements pertaining to compensation or payment for extra work, disputed work, and/or changed conditions. Failure to follow such contractual requirements shall bar any claims or subsequent lawsuits for compensation or payment thereon.

g. Supporting Documentation: The Contractor shall submit all claims in the following format:

1. Summary of claim merit and price, reference Contract Document provisions pursuant to which the claim is made

2. List of documents relating to claim:
   (a) Specifications
   (b) Drawings
   (c) Clarifications (Requests for Information)
   (d) Schedules
   (e) Other

3. Chronology of events and correspondence

4. Analysis of claim merit

5. Analysis of claim cost

6. Time impact analysis in CPM format

h. City’s Response. Upon receipt of a claim pursuant to this Article, City shall conduct a reasonable review of the claim and, within a period not to exceed 45 days, shall provide the Contractor a written statement identifying what portion of the claim is disputed and what portion is undisputed. Any payment due on an
undisputed portion of the claim will be processed and made within 60 days after the public entity issues its written statement.

1. If the City needs approval from the City Council to provide the Contractor a written statement identifying the disputed portion and the undisputed portion of the claim, and the City Council 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 City shall have up to three days following the next duly publicly noticed meeting of the City Council after the 45-day period, or extension, expires to provide the Contractor a written statement identifying the disputed portion and the undisputed portion.

2. Within 30 days of receipt of a claim, the City may request in writing additional documentation supporting the claim or relating to defenses or claims the City may have against the Contractor. If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of City and the Contractor. The City’s written response to the claim, as further documented, shall be submitted to the Contractor within 30 days (if the claim is less than $15,000, within 15 days) after receipt of the further documentation, or within a period of time no greater than that taken by the Contractor in producing the additional information or requested documentation, whichever is greater.

i. **Meet and Confer.** If the Contractor disputes the City’s written response, or the City fails to respond within the time prescribed, the Contractor may so notify the City, in writing, either within 15 days of receipt of the City’s response or within 15 days of the City’s failure to respond within the time prescribed, respectively, and demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand, the City shall schedule a meet and confer conference within 30 days for settlement of the dispute.

j. **Mediation.** 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 Contractor 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 Contractor sharing the associated costs equally. The public entity and Contractor shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing, unless the parties agree to select a mediator at a later time.

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1. 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.

2. 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.

3. 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.

4. The mediation shall be held no earlier than the date the Contractor completes the Work or the date that the Contractor last performs Work, whichever is earlier. All unresolved claims shall be considered jointly in a single mediation, unless a new unrelated claim arises after mediation is completed.

k. If following the mediation, the claim or any portion remains in dispute, the Contractor must file a claim pursuant to Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code prior to initiating litigation. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the Contractor submits his or her written claim pursuant to subdivision (a) until the time the claim is denied, including any period of time utilized by the meet and confer conference.

l. The following procedures are established for all civil actions filed to resolve claims of $375,000 or less:

1. Within 60 days, but no earlier than 30 days, following the filing or responsive pleadings, the court shall submit the matter to non-binding mediation unless waived by mutual stipulation of both parties or unless mediation was held prior to commencement of the action in accordance with Public Contract Code section 9204 and the terms of this Agreement. The mediation process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court.
2. If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1114.11 of that code. The Civil Discovery Act of 1986 (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3 of Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

i. In addition to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, (A) arbitrators shall, when possible, be experienced in construction law, and (B) any party appealing an arbitration award who does not obtain a more favorable judgment shall, in addition to payment of costs and fees under that chapter, also pay the attorney’s fees on appeal of the other party.

m. **Government Code Claims:** In addition to any and all contract requirements pertaining to notices of and requests for compensation or payment for extra work, disputed work, construction claims and/or changed conditions, the Contractor must comply with the claim procedures set forth in Government Code Sections 900, et seq. prior to filing any lawsuit against the City. Such Government Code claims and any subsequent lawsuit based upon the Government Code claims shall be limited to those matters that remain unresolved after all procedures pertaining to extra work, disputed work, construction claims, and/or changed conditions have been followed by Contractor. If no such Government Code claim is submitted, or if the prerequisite contractual requirements are not satisfied, no action against the City may be filed. **A Government Code claim must be filed no earlier than the date the work is completed or the date the Contractor last performs work on the Project, whichever occurs first.** A Government Code claim shall be inclusive of all unresolved claims unless a new unrelated claim arises after the Government Code claim is submitted.

n. The City’s failure to respond to a claim from the Contractor within the time periods described in this Article or to otherwise meet the time requirements of this Article shall result in the claim being deemed rejected in its entirety.

**ARTICLE 48. CITY’S RIGHT TO TERMINATE CONTRACT**

a. **Termination for Cause:** The City may, without prejudice to any other right or remedy, serve written notice upon Contractor of its intention to terminate this Contract in whole or in part if the Contractor: (i) refuses or fails to prosecute the Work or any part thereof with such diligence as will ensure its completion within the time required; (ii) fails to complete the Work within the required time; (iii) should file a bankruptcy petition or be adjudged a bankrupt; (iv) should make a general assignment for the benefit of its creditors; (v) should have a receiver
appointed; (vi) should persistently or repeatedly refuse or fail to supply enough properly skilled workers or proper materials to complete the Work; (vii) should fail to make prompt payment to subcontractors or for material or labor; (viii) persistently disregard laws, ordinances, other requirements or instructions of the City; or (ix) should violate any of the provisions of the Contract Documents.

The notice of intent to terminate shall contain the reasons for such intention to terminate, and what actions, if any, Contractor may take to cure the breach. Within ten (10) Days after the service of such notice, Contractor shall remedy the breaches noted in the notice of intent to terminate or make arrangements acceptable to the City for the required corrective action. After expiration of the ten (10) Day period, City may terminate the Contract by providing a Notice of Termination to the Contractor. The City may take over and complete the Work by any method it may deem appropriate. Contractor and its surety shall be liable to the City for any excess costs or other damages incurred by the City to complete the Work. If the City takes over the Work, the City may, without liability for so doing, take possession of and utilize in completing the Work such materials, appliances, plant, and other property belonging to the Contractor as may be on the Site.

Upon termination, Contractor shall:

1. Stop Work as specified in the Notice of Termination.
2. Leave the Site and any other property upon which the Contractor was working in a safe and sanitary manner such that it does not pose any threat to the public health or safety.
3. Terminate all subcontracts and purchase orders to the extent that they relate to the portions of the Work terminated.

Upon termination, Contractor shall not be entitled to receive any further payment from City, except for Work which was duly performed prior to the Effective Date of the Notice of Termination. Contractor shall submit an invoice for final payment within thirty (30) Days of the Effective Date of the Notice of Termination. City may withhold from final payment up to 150% of any disputed amounts, including any amounts which may be necessary to repair defective Work, complete unfinished Work, or are otherwise occasioned by Contractor’s failure to perform its duties under the Contract.

b. **Termination for Convenience:** The City may terminate performance of the Work, in whole or in part, upon ten (10) Days written notice if the City determines that termination is in the City’s interest.

The Contractor shall cease all or the specified part of the Work upon delivery to the Contractor of a Notice of Termination specifying that the termination is for the
convenience of the City, the extent of termination, and the effective date of such termination.

After receipt of Notice of Termination, and except as directed by the City, the Contractor shall, regardless of any delay in determining or adjusting any amounts due under this Termination for Convenience clause, immediately proceed with the following obligations:

1. Stop Work as specified in the Notice.

2. Complete any Work specified in the Notice of Termination in a least cost/shortest time manner while still maintaining the quality called for under the Contract Documents.

3. Leave the Site and any other property upon which the Contractor was working in a safe and sanitary manner such that it does not pose any threat to the public health or safety.

4. Terminate all subcontracts and purchase orders to the extent that they relate to the portions of the Work terminated.

5. Place no further subcontracts or orders, except as necessary to complete the remaining portion of the Work.

6. Submit to the City, within ten (10) Days from the effective date of the Notice of Termination, all of the documentation called for by the Contract Documents to substantiate all costs incurred by the Contractor for labor, materials and equipment through the Effective Date of the Notice of Termination. Any documentation substantiating costs incurred by the Contractor solely as a result of the City’s exercise of its right to terminate this Contract pursuant to this clause, which costs the Contractor is authorized under the Contract Documents to incur, shall: (i) be submitted to and received by the City no later than thirty (30) Days after the Effective Date of the Notice of Termination; (ii) describe the costs incurred with particularity; and (iii) be conspicuously identified as “Termination Costs Occasioned by the City’s Termination for Convenience.”

7. Contractor shall be entitled to receive only the amounts payable under this section, and Contractor specifically waives any claim for any other amounts or damages, including, but not limited to, any claim for consequential damages or lost profits. The provisions in this section are in addition to and not in limitation of any other rights or remedies available to the City.

c. Notwithstanding any other provision of this Article, when immediate action is necessary to protect life and safety or to reduce significant exposure or liability,
the City may immediately order Contractor to cease Work until such safety or liability issues are addressed to the satisfaction of the City or the Contract is terminated.

ARTICLE 49. WARRANTY AND GUARANTEE

a. Contractor warrants that all materials and equipment furnished under this Contract shall be new unless otherwise specified in the Contract Documents; and that all Work conforms to the Contract Document requirements and is free of any defect whether performed by the Contractor or any subcontractor or supplier.

b. Unless otherwise stated, all warranty periods shall begin upon the filing of the Notice of Completion. Unless otherwise stated, the warranty period shall be for one year.

c. The Contractor shall remedy at its expense any damage to City-owned or controlled real or personal property.

d. Contractor shall furnish the City with all warranty and guarantee documents prior to final acceptance of the Work by the City.

e. The City shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage. The Contractor shall within ten (10) Days after being notified commence and perform with due diligence all necessary Work to complete or correct the work at issue. If the Contractor fails to promptly remedy any defect, or damage within this time; the City shall have the right to replace, repair, or otherwise remedy the defect, or damage at the Contractor’s expense.

f. In the event of any emergency constituting an immediate hazard to health, safety, property, when caused by Work of the Contractor not in accordance with the Contract requirements, the City may undertake at Contractor’s expense, and without prior notice, all Work necessary to correct such condition.

g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for Work performed and Materials furnished under this Contract, the Contractor shall:

1. Obtain for City all warranties that would be given in normal commercial practice or that are required in the Contract Documents;

2. Require all warranties to be executed, in writing, for the benefit of the City; and

3. Enforce all warranties for the benefit of the City, unless otherwise directed in writing by the City.
h. This Article shall not limit the City’s rights under this Contract or with respect to latent defects, gross mistakes, or fraud. The City specifically reserves all rights related to defective work, including but not limited to the defect claims pursuant to California Code of Civil Procedure Section 337.15.

ARTICLE 50. DOCUMENT RETENTION & EXAMINATION

a. In accordance with Government Code Section 8546.7, records of both the City and the Contractor shall be subject to examination and audit by the State Auditor General for a period of three (3) years after final payment.

b. Contractor shall make available to the City any of the Contractor’s other documents related to the Work immediately upon request of the City.

c. In addition to the State Auditor’s rights described above, the City shall have the right to examine and audit all books, estimates, records, contracts, documents, bid documents, subcontracts, and other data of the Contractor (including electronic records, computations and projections) related to negotiating, pricing, or performing the Work in order to evaluate the accuracy and completeness of the cost or pricing data, for a period of four (4) years after final payment.

ARTICLE 51. SOILS INVESTIGATIONS

When a soils investigation report for the Site is available, such report shall not be a part of the Contract Documents. Any information obtained from such report as to subsurface soil conditions, or to elevations of existing grades or elevations of underlying rock, is approximate only and is not guaranteed. Contractor acknowledges that any soils investigation report (including any borings) was prepared for purposes of design only and Contractor is required to examine the Site before submitting its bid and must make whatever tests it deems appropriate to determine the underground condition of the soil. Contractor shall be responsible for any costs resulting from Contractor’s failure to examine the Site pursuant to this Article.

ARTICLE 52. SEPARATE CONTRACTS

a. The City reserves the right to let other contracts in connection with this Work or on the Site. Contractor shall cooperate with and permit other contractors reasonable access and storage of their materials and execution of their work and shall properly connect and coordinate its Work with theirs.

b. To ensure proper execution of its subsequent Work, Contractor shall immediately inspect work already in place and shall at once report to the City any problems with the work in place or discrepancies with the Contract Documents.

c. Contractor shall ascertain to its own satisfaction the scope of the Work and nature of any other contracts that have been or may be awarded by the City in

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prosecution of the Work to the end that Contractor may perform this Contract in the light of such other contracts, if any. Nothing herein contained shall be interpreted as granting to Contractor exclusive occupancy at the Site. Contractor shall not cause any unnecessary hindrance or delay to any other contractor working on the Work. If simultaneous execution of any contract for the Work is likely to cause interference with performance of some other contract or contracts, the City shall decide which contractor shall cease Work temporarily and which contractor shall continue or whether work can be coordinated so that contractors may proceed simultaneously. The City shall not be responsible for any damages suffered or for extra costs incurred by Contractor resulting directly or indirectly from award, performance, or attempted performance of any other contract or contracts on the Site.

ARTICLE 53. NOTICE AND SERVICE THEREOF

All notices shall be given in writing by personal delivery, mail, or email to the other party as described below:

    Notices to "Contractor" shall be sent according to the information provided in the Bid Forms under "INFORMATION ABOUT BIDDER", unless Contractor designates another address in writing.

    Notices to "City" shall be sent to the City's Public Works Department, to the attention of the City's Project Manager, as named (and email address provided) in Article 3 of the "INSTRUCTION TO BIDDERS", unless City designates another Project Manager in writing. Notice to City given by facsimile shall not be accepted. Notice to City via email shall not be effective unless receipt of said email is acknowledged by the City's response via email.

ARTICLE 54. NOTICE OF THIRD PARTY CLAIMS

Pursuant to Public Contract Code Section 9201, the City shall provide Contractor with timely notification of the receipt of any third-party claim relating to the Contract.

ARTICLE 55. STATE LICENSE BOARD NOTICE.

Contractors are required by law to be licensed and regulated by the Contractors' State License Board which has jurisdiction to investigate complaints against contractors if a complaint regarding a patent act or omission is filed within four (4) years of the date of the alleged violation. A complaint regarding a latent act or omission pertaining to structural defects must be filed within ten (10) years of the date of the alleged violation. Any questions concerning a contractor may be referred to the Registrar, Contractors' State License Board, P.O. Box 26000, Sacramento, California 95826.
ARTICLE 56. INTEGRATION

a. Oral Modifications Ineffective. No oral order, objection, direction, claim or notice by any party or person shall affect or modify any of the terms or obligations contained in the Contract Documents.


ARTICLE 57. ASSIGNMENT

Contractor shall not assign, transfer, convey, sublet, or otherwise dispose of this Contract or any part thereof including any claims, without prior written consent of the City. Any assignment without the written consent of the City shall be void. Any assignment of money due or to become due under this Contract shall be subject to a prior lien for services rendered or Material supplied for performance of Work called for under the Contract Documents in favor of all persons, firms, or corporations rendering such services or supplying such Materials to the extent that claims are filed pursuant to the Civil Code, the Code of Civil Procedure or the Government Code.

ARTICLE 58. CHANGE IN NAME AND NATURE OF CONTRACTOR’S LEGAL ENTITY

Should a change be contemplated in the name or nature of the Contractor’s legal entity, the Contractor shall first notify the City in order that proper steps may be taken to have the change reflected on the Contract and all related documents.

ARTICLE 59. ASSIGNMENT OF ANTITRUST ACTIONS

Pursuant to Section 7103.5 of the Public Contract Code, in entering into a public works contract or subcontract to supply goods, services, or materials pursuant to a public works contract, Contractor or subcontractor offers and agrees to assign to the City all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act (chapter 2 (commencing with Section 16700) of part 2 of division 7 of the Business and Professions Code), arising from the purchase of goods, services, or materials pursuant to this Contract or any subcontract. This assignment shall be made and become effective at the time the City makes final payment to the Contractor, without further acknowledgment by the parties.

ARTICLE 60. PROHIBITED INTERESTS

No City official or representative who is authorized in such capacity and on behalf of the City to negotiate, supervise, make, accept, or approve, or to take part in negotiating, supervising, making, accepting or approving any engineering, inspection, construction
or material supply contract or any subcontract in connection with construction of the Work, shall be or become directly or indirectly interested financially in the Contract.

ARTICLE 61. LAWS AND REGULATIONS

a. Contractor shall give all notices and comply with all federal, state and local laws, ordinances, rules and regulations bearing on conduct of work as indicated and specified by their terms. References to specific laws, rules or regulations in this Contract are for reference purposes only, and shall not limit or affect the applicability of provisions not specifically mentioned. If Contractor observes that drawings and specifications are at variance therewith, he shall promptly notify the City in writing and any necessary changes shall be adjusted as provided for in this Contract for changes in work. If Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the City, he shall bear all costs arising therefrom.

b. Contractor shall be responsible for familiarity with the Americans with Disabilities Act (“ADA”) (42 U.S.C. § 12101 et seq.). The Work will be performed in compliance with ADA laws, rules and regulations. Contractor shall comply with the Historic Building Code, including, but not limited to, as it relates to the ADA, whenever applicable.

c. Contractor acknowledges and understands that, pursuant to Public Contract Code Section 20676, sellers of "mined material" must be on an approved list of sellers published pursuant to Public Resources Code Section 2717(b) in order to supply mined material for this Contract.

ARTICLE 62. PATENT FEES OR ROYALTIES.

The Contractor shall include in its bid amount the patent fees or royalties on any patented article or process furnished or used in the Work. Contractor shall assume all liability and responsibility arising from the use of any patented, or allegedly patented, materials, equipment, devices or processes used in or incorporated with the Work, and shall defend, indemnify and hold harmless the City, its officials, officers, agents, employees and representatives from and against any and all liabilities, demands, claims, damages, losses, costs and expenses, of whatsoever kind or nature, arising from such use.

ARTICLE 63. OWNERSHIP OF DRAWINGS

All Contract Documents furnished by the City are City property. They are not to be used by Contractor or any subcontractor on other work nor shall Contractor claim any right to such documents. With exception of one complete set of Contract Documents, all documents shall be returned to the City on request at completion of the Work.
ARTICLE 64.  NOTICE OF TAXABLE POSSESSORY INTEREST

In accordance with Revenue and Taxation Code Section 107.6, the Contract Documents may create a possessory interest subject to personal property taxation for which Contractor will be responsible.
ARTICLE 42 OF THE GENERAL CONDITIONS SHALL BE AMENDED TO INCLUDE THE FOLLOWING ADDITIONAL CONDITIONS AFTER ITEM 42.L:

The Contractor shall fully comply with all terms and conditions of the contract in a timely manner and in accordance with the requirements set forth in the contract documents. Should the contractor not fully comply with the contract documents:

- Contractor guarantees that it will timely perform the obligations below, and in the event that it fails to do so, City and the Contractor hereby agree that the City may back charge costs in the following amounts in accordance with the procedures set forth in Article 42:

<table>
<thead>
<tr>
<th>Item #</th>
<th>Non-Compliance in connection with:</th>
<th>Action &amp; Deduction</th>
<th>Curing time</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Superintendent’s presence at the jobsite full time/during all hours of work, per Article 11 of the General Conditions</td>
<td>Deduction = $200/working hour</td>
<td>&quot;None&quot;</td>
<td>No curing time allowed, immediate deduction applies per working hour of non-compliance</td>
</tr>
<tr>
<td>2</td>
<td>Submittal of 3-weeks lookahead construction schedule updates at weekly progress meetings, per Specification 01 32 13</td>
<td>Deduction = $350/24 hours (working day) delay following the curing time</td>
<td>&quot;24 Hours&quot; following the due date/time</td>
<td>Once curing time expires, the deduction applies per 24 hours (working day), if not submitted, or submittal is not acceptable/reasonable, or requires correction/modification</td>
</tr>
<tr>
<td>3</td>
<td>Submittal of Monthly construction schedule updates, per Specification 01 32 13</td>
<td>Deduction = $500/24 hours (working day) delay following the curing time</td>
<td>&quot;48 Hours&quot; following the due date/time</td>
<td>Once curing time expires, the deduction applies per 24 hours (working day), if not submitted, or submittal is not acceptable/reasonable, or requires correction/modification</td>
</tr>
<tr>
<td>4</td>
<td>Traffic Control timely and accurate setup, take down, implementation and maintenance, per Specification 01 55 26</td>
<td>Deduction = $200/hour delay following the curing time</td>
<td>&quot;One Hour&quot; following notification by the City</td>
<td>Once curing time expires, the deduction applies per hour of non-compliance</td>
</tr>
<tr>
<td>5</td>
<td>SWPPP/BMP’s requirements, per Specification 0157 21</td>
<td>Deduction = $300/hour delay following the curing time</td>
<td>&quot;Two Hours&quot; following notification by the City</td>
<td>Once curing time expires, the deduction applies per hour of non-compliance</td>
</tr>
</tbody>
</table>
The enforcement of any of the above backcharge deductions shall be cumulative to all other rights and remedies afforded the City and shall not preclude or limit the City from exercising any other legal rights or remedies, including but not limited to the rights to pursue actual damages resulting from a breach and/or termination of the contract resulting from a breach.

ARTICLE 65 SHALL BE ADDED TO THE GENERAL CONDITIONS TO READ AS FOLLOWS:

ARTICLE 65. CITY’S RIGHT TO STOP THE WORK
If Contractor fails to correct defective Work, fails to perform the Work in accordance with the Contract Documents, or violates any applicable law, City may immediately order Contractor to stop the Work, or any portion thereof, until Contractor has eliminated the cause for such order. Contractor shall immediately comply with any stop Work order at Contractor’s own expense. City shall have no duty or responsibility to Contractor or any other party to exercise its right to stop the Work.
CONTRACT FORMS

Notice of Intended Award
Notice of Award
Notice to Proceed
Work Directive
Change Order
Cost Proposal Breakdown Summary
RFI Cover Sheet
Submittal Cover Sheet
Notice of Completion
NOTICE OF INTENDED AWARD

To: All Bidders submitting bids for:  Dated: _______________

La Granada Pump Station Project  
CITY PROJECT NO. CI8082

You are hereby notified that award for this project will be recommended to the City Council or City Manager as follows:

Apparent lowest responsible Bidder: (Name, City, State).

Bid Price of the contract: $____________.

Scheduled award date by the City Council/City Manager: ________________.

Any interested party may file a written protest regarding the intended award noted above in strict compliance with the following:

• Protests must be filed with the City within five (5) business days from the date of this notice; that is, by 5:00 P.M. on ________________.

• Protests must state the grounds and facts for the protest and include any evidence that supports the protest.

• Protests must be in writing, and submitted via mail or email to the attention of both of the following City representatives:
  o Cliff Finley, Public Works Director (cfinley@toaks.org)
  o Chandani Gunasekara Project Manager (cgunasekara@toaks.org)

The City shall issue a written decision on the protest. If the award is for an amount greater than $200,000, the City’s decision may be appealed to the City Council. Any appeal must be in writing and filed within five business days from the date of City’s written decision on the protest.

CITY OF THOUSAND OAKS

________________________________
By:  
Title:  

CONTRACT FORMS
NOTICE OF AWARD

<<DATE>>

To: ____________________________________________________________
   (Bidder)

Address: _______________________________________________________________________________________

La Granada Pump Station
CITY PROJECT NO. CI 8082; SPECIFICATION NO. 2018/2019-25

You are hereby notified that your Bid dated ________________ for the above Contract has been considered. You are the apparent successful bidder and have been awarded a contract for the above-named project.

The Bid Price of your contract is $XXXXXX.

You must comply with the following conditions within 10 calendar days of the date of this Notice of Award; that is, by ____________________.

1. You must deliver to the City, the fully executed counterpart of the Contract.
2. You must deliver, with the executed Contract, the Payment and Performance Bonds as specified in the Instructions to Bidders.
3. You must deliver all required insurance documents as specified in the Instructions to Bidders and in Article 37 of the General Conditions, and complete the attached Insurance Checklist.
4. You must prepare and submit to the City, your Preliminary Critical Path Method work schedule in accordance with Article 6 of the General Conditions, and Specification 01 32 13.

You must also provide the following items within 21 days of this notice, by ________________:
   A. Traffic Control Plans as required in Specification 01 55 26, and
   B. A complete list of submittals as required in Specification 01 32 19.

All of the above items shall be submitted to ________________ (name of project manager), City of Thousand Oaks Public Works Department.

Failure to comply with these conditions within the time specified will entitle the City to consider your Bid abandoned, to annul this Notice of Award, and to declare your Bid Security forfeited.

After you comply with the foregoing conditions, the City will return to you one fully signed counterpart of the Contract with the Contract Documents attached.

CITY OF THOUSAND OAKS

________________________________________
By:
Title:

CONTRACT FORMS

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CITY OF THOUSAND OAKS
NOTICE TO PROCEED

Date: ________________

Contractor:
Address:
Contract No.:
Project:

Subject: NOTICE TO PROCEED

Dear ________________:

You are hereby notified to that the Contract Time under the above Contract will commence to run on [INSERT START DATE], and the Work must be complete within [INSERT NUMBER OF DAYS] days thereafter.

The date of completion of the Work is therefore [INSERT COMPLETION DATE]. Article 38 of the Contract provides for an assessment of liquidated damages for each and every calendar day after the above established contract completion date that the Work remains incomplete.

Please proceed to comply with all Submittal and Schedule Requirements listed in the Contract Documents, and Specifications 01 32 13 and 01 32 19, including the updated Initial Construction Schedule.

[INSERT ADDITIONAL INSTRUCTIONS IF NECESSARY]

Please contact me at 805-449-XXXX if you have questions. We are looking forward to a mutually successful project.

CITY OF THOUSAND OAKS

BY: __________________________

Title: _________________________
CITY OF THOUSAND OAKS
WORK DIRECTIVE

Project: ____________________  Work Directive Number: ________________
CI Number: ____________________  Work Directive Date: ________________
Contract #: ____________________  Contract Date: ____________________

To: [INSERT CONTRACTOR NAME, CONTACT INFORMATION AND REPRESENTATIVE]

THIS WORK DIRECTIVE FORM SHALL BE USED FOR ALL WORK DIRECTIVES
ASSOCIATED WITH THE WORK. NO ADDITIONS OR DELETIONS TO THIS FORM SHALL
BE ALLOWED, EXCEPT WITH PERMISSION OF THE CITY OF THOUSAND OAKS.

You are directed to make the following change(s) in the Work:

[INSERT DESCRIPTION OF CHANGE]

NOT VALID UNTIL SIGNED BY OWNER

Attachments: [E.G., REVISED PLANS OR SPECIFICATIONS OR ITEMIZED CONTRACTOR
PROPOSAL – IF NONE, DELETE THIS LINE]

THIS WORK DIRECTIVE DOES NOT APPROVE A CHANGE TO THE CONTRACT PRICE OR
THE CONTRACT TIME. The Contract Price and Contract Time may only be adjusted by
Change Order. To the extent this Work Directive results in a change to the Contract Price or the
Contract Time, Contractor must timely request a Change Order and comply with all Change
Order procedures in accordance with the Contract Documents. Notwithstanding issuance of this
Work Directive, the failure to timely request a Change Order shall constitute a waiver by
Contractor of any adjustment to the Contract price or the Contract time resulting from this Work
Directive. If an adjustment is requested, no work shall be allowed to lag pending such
adjustment, but shall be promptly executed as directed, even if a dispute arises.

ISSUED BY:
CITY OF THOUSAND OAKS

Signature:____________________
Printed Name:__________________
Title:_________________________
Date:_________________________

REVIEWED/APPROVED BY CITY ENGINEER:
(Approved per TOMC 3-10.303 or as directed by City Council)

Signature:____________________
Printed Name:__________________
Title:_________________________
Date:_________________________

CONTRACT FORMS
CITY OF THOUSAND OAKS
CHANGE ORDER

Project: __________________________  Change Order Number: __________________________
CI Number: __________________________  Change Order Date: __________________________
Contract #: __________________________  Contract Date: __________________________

To: [INSERT CONTRACTOR NAME, CONTACT INFORMATION AND REPRESENTATIVE]

THIS CHANGE ORDER FORM SHALL BE USED FOR ALL CHANGE ORDERS ASSOCIATED WITH
THE WORK. NO ADDITIONS OR DELETIONS TO THIS FORM SHALL BE ALLOWED, EXCEPT WITH
PERMISSION OF THE CITY OF THOUSAND OAKS.

The Contract is changed as follows:

[INSERT DESCRIPTION OF CHANGE]

Contractor agrees to furnish all labor, materials, equipment and services to perform the Work, modified as
described herein, in accordance with the Contract Documents as revised by this Change Order.

NOT VALID UNTIL SIGNED BY OWNER

In consideration of the change(s) described above, the Contract Price is adjusted as follows:

The original Contract Price was $____________________
Net change by previously authorized Change Orders $____________________
The Contract Price prior to this Change Order was $____________________
The Contract Price will be changed by this Change Order in the amount of $____________________
The new Contract Price including this Change Order will be $____________________

In consideration of the change(s) described above, the Contract Time is adjusted as follows:

The Contract Time will be (increased) (decreased) (unchanged) by (____) Days
The date of Completion as of the date of this Change Order therefore is ____/____/____

Attachments: [E.G., REVISED PLANS OR SPECIFICATIONS OR ITEMIZED CONTRACTOR
PROPOSAL – IF NONE, DELETE THIS LINE]

Contractor accepts the terms and conditions stated herein as full and final settlement of any and all
claims arising from this Change Order. The adjustments to the Contract Price and Contract Time in this
Change Order constitute the entire compensation and/or adjustment thereto due to Contractor, including
but not limited to all direct, indirect, consequential, profit, labor, equipment, tools, idle time, incidentals,
and overhead (field and home office) costs, due to Contractor arising out of or related to the change in the
Work covered by this Change Order.

CONTRACT FORMS
REQUESTED BY: __________________________________________  Date:___________

Contractor

REVIEWED BY: __________________________________________  Date:___________

Project Manager

ACCEPTED BY: __________________________________________  Date:___________

Division Manager/Deputy Director Operations

APPROVED BY: __________________________________________  Date:___________

City Engineer

APPROVED BY: __________________________________________  Date:___________

Jay T. Spurgin, Public Works Director

APPROVED BY: __________________________________________  Date:___________

City Manager

APPROVED AS TO FORM: __________________________________________  Date:___________

Assistant City Attorney
## Cost Proposal Breakdown Summary

**RFI #:**

**WDC #:**

**Date:**

**Project No. & Name:**

**Description:**

**Contractor:**

### Labor

<table>
<thead>
<tr>
<th>Description</th>
<th>Hours</th>
<th>Rate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>$</td>
<td></td>
</tr>
</tbody>
</table>

Subtotal Labor: $

### Equipment

<table>
<thead>
<tr>
<th>Description</th>
<th>Hours</th>
<th>Rate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>$</td>
<td></td>
</tr>
</tbody>
</table>

Subtotal Equipment: $

### Materials

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Total</th>
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<tbody>
<tr>
<td>1</td>
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<td>$</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>$</td>
<td></td>
</tr>
</tbody>
</table>

Subtotal Materials: $

Tax on Materials: $

Subtotal of Materials with Tax: $

### Subcontractors

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>$</td>
<td></td>
</tr>
</tbody>
</table>

Subtotal Subcontractor: $

### Markup Breakdown

<table>
<thead>
<tr>
<th>Percent</th>
<th>Amount</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Markup Labor</td>
<td>15%</td>
<td>$</td>
</tr>
<tr>
<td>Markup Equipment</td>
<td>10%</td>
<td>$</td>
</tr>
<tr>
<td>Markup Materials</td>
<td>10%</td>
<td>$</td>
</tr>
<tr>
<td>Markup Subcontractors</td>
<td>10%</td>
<td>$</td>
</tr>
</tbody>
</table>

Markup Subtotal: $

### Total Cost

Total Cost: $

---

**CONTRACT FORMS**

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REQUEST FOR INFORMATION (RFI)

Project No. and Name: ____________________________________________

Contractor: _______________________________ RFI Number: _________

Address: ________________________________________ Revision No.: _________

Tel.: ___________________________________________ Date: ______________

Attention To: ___________________________________________

___________________________ Drawing Number/Detail

___________________________ Specification Section

Request:

Requested by: ________________________________

Contractor’s Sign Name (Printed) Date

Time: ________________ Cost Impact: ______________

Response:

Response by: ________________________________

Project Engineer Name (Printed) Date

by: _________________________________________

Project Manager Name (Printed) Date
**SUBMITTAL TRANSMITTAL SHEET**

<table>
<thead>
<tr>
<th>Project No. &amp; Name</th>
<th>Submittal No.:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor:</td>
<td></td>
</tr>
<tr>
<td>Address:</td>
<td>Revision No.:</td>
</tr>
<tr>
<td>Tel.:</td>
<td>Date:</td>
</tr>
</tbody>
</table>

**Attention To:**

**Subject of Submittal**

**Specification Section / Submittal Designation**

<table>
<thead>
<tr>
<th>Check One:</th>
<th>(not a form for substitutions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>This is a variance from the contract requirements</td>
</tr>
<tr>
<td>☐</td>
<td>We have verified that the material or equipment in this submittal meets all the requirements of the contract.</td>
</tr>
</tbody>
</table>

**Submittal By:**

<table>
<thead>
<tr>
<th>Authorized Signature</th>
<th>Name (Printed)</th>
<th>Date</th>
</tr>
</thead>
</table>

**Response / Comments:**

<table>
<thead>
<tr>
<th>Reserved for Response Stamp</th>
</tr>
</thead>
</table>

**Reviewed By:**

<table>
<thead>
<tr>
<th>Authorized Signature</th>
<th>Name (Printed)</th>
<th>Date</th>
</tr>
</thead>
</table>
NOTICE OF COMPLETION

NOTICE IS HEREBY GIVEN that the CITY OF THOUSAND OAKS, VENTURA COUNTY, CALIFORNIA, is the owner in fee or of an easement over the following described property, to-wit:

That on or about the XXth day of <<MONTH YEAR>>, the said City of Thousand Oaks entered into a contract with <<CONTRACTOR>> for the construction of 2018/2019-25 La Granada Pump Station Project, on that certain real property described as <<ADDRESS OR LOCATION>> within the said City of Thousand Oaks, that said structures and/or improvements were actually completed on the XXst day of <<MONTH YEAR>>, and that the address of said City of Thousand Oaks is 2100 Thousand Oaks Boulevard, Thousand Oaks, California 91362.

By

___________________________________
Agent –
Title
City of Thousand Oaks, California

STATE OF CALIFORNIA )
) ss.
COUNTY OF VENTURA )

<INSERT NAME> does hereby certify or declare under penalty of perjury that the foregoing is true and correct under the laws of the State of California; that he is the duly authorized agent for the City of Thousand Oaks, State of California; that he therefore verifies the foregoing Notice of Completion on behalf of the City of Thousand Oaks; that the City is the owner of the property described in the foregoing Notice; that he has read the foregoing Notice and knows the contents thereof; that he has personal knowledge of the facts therein stated that same are true.

Date: _______________

___________________________________
<INSERT NAME>
City of Thousand Oaks, California

Place: Thousand Oaks, California

Authority: City Council Resolution 2010-036
TECHNICAL SPECIFICATIONS

THE FOLLOWING TECHNICAL SPECIFICATIONS ARE INCORPORATED HEREIN BY REFERENCE AS IF SET FORTH IN THEIR ENTIRETY:

DIVISION 01 – GENERAL REQUIREMENTS

<table>
<thead>
<tr>
<th>Spec #</th>
<th>Spec Name</th>
</tr>
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<tbody>
<tr>
<td>01 11 00</td>
<td>Summary of Work</td>
</tr>
<tr>
<td>01 22 00</td>
<td>Measurement &amp; Payment</td>
</tr>
<tr>
<td>01 31 13</td>
<td>Coordination</td>
</tr>
<tr>
<td>01 31 19</td>
<td>Project Meetings</td>
</tr>
<tr>
<td>01 32 13</td>
<td>CPM Schedule</td>
</tr>
<tr>
<td>01 32 19</td>
<td>Contractor Submittals</td>
</tr>
<tr>
<td>01 42 13</td>
<td>Abbreviations</td>
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<tr>
<td>01 42 19</td>
<td>Reference Standards</td>
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<td>01 45 00</td>
<td>Quality Control</td>
</tr>
<tr>
<td>01 51 00</td>
<td>Temporary Utilities</td>
</tr>
<tr>
<td>01 52 00</td>
<td>Engineer's Field Office, Equipment and Services</td>
</tr>
<tr>
<td>01 55 00</td>
<td>Site Access and Parking</td>
</tr>
<tr>
<td>01 55 26</td>
<td>Temporary Traffic Control</td>
</tr>
<tr>
<td>01 56 00</td>
<td>Temporary Environmental Controls</td>
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<tr>
<td>01 58 00</td>
<td>Project Identification</td>
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<tr>
<td>01 60 00</td>
<td>Materials and Equipment</td>
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<td>01 64 00</td>
<td>Manufacturer's Field Services</td>
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<td>01 65 00</td>
<td>Delivery, Storage, and Handling</td>
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<tr>
<td>01 71 19</td>
<td>Site Safety Plan</td>
</tr>
<tr>
<td>01 71 23</td>
<td>Construction Surveying</td>
</tr>
<tr>
<td>01 71 33</td>
<td>Protection of Existing Facilities</td>
</tr>
<tr>
<td>01 74 19</td>
<td>Construction Waste Management</td>
</tr>
<tr>
<td>01 75 00</td>
<td>Facility Startup</td>
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<td>Project Closeout</td>
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DIVISION 02 – SITEWORK AND UTILITIES

<table>
<thead>
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<th>Spec #</th>
<th>Spec Name</th>
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<tbody>
<tr>
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<td>Existing Utilities Marking and Potholing</td>
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<tr>
<td>02 05 00</td>
<td>Demolition, Modification and Relocation</td>
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<tr>
<td>02 14 00</td>
<td>Dewatering and Drainage</td>
</tr>
<tr>
<td>02 15 00</td>
<td>Clearing and Grubbing</td>
</tr>
<tr>
<td>02 20 00</td>
<td>Earthwork</td>
</tr>
<tr>
<td>02 22 00</td>
<td>Trenching, Backfilling and Compaction</td>
</tr>
<tr>
<td>02 23 00</td>
<td>Granular and Rock Materials</td>
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02 25 00 – Cement-Sand Slurry
02 40 00 – Sheeting, Shoring and Bracing
02 51 20 – Pavement and Base
02 51 30 – Slurry Seal
02 52 50 – Pavement Striping and Markings
02 58 00 – Electrical and Communication Pole
02 62 00 – Steel Pipe and Fittings
02 63 00 – Small Diameter PVC Pipe and Fittings
02 64 20 – Small Valves and Pipes
02 64 40 – Pipe Appurtenances
02 66 00 – Water Pipeline Testing and Disinfection
02 81 00 – Landscape Irrigation System
02 83 00 – Chain Link fences and Gates
02 99 00 – Miscellaneous Work

DIVISION 03 – CONCRETE

Spec # Spec Name

03 30 00 – Concrete Work
03 40 00 – Precast Concrete Manholes and Boxes
03 45 00 – Precast Concrete Utility and Drain Structures
03 60 00 – Grout
03 74 00 – Modifications and Repairs to Concrete

DIVISION 04 – MASONRY

Spec # Spec Name

04 22 00 – Reinforced Concrete Block Masonry
04 27 00 – Glass Unit Masonry

DIVISION 05 – METALS

Spec # Spec Name

05 12 00 – Structural Steel
05 50 00 – Metal Work - General Provisions
05 51 50 – Miscellaneous Metal Items
05 53 00 – Metal Gratings and Cover Plates

DIVISION 06 – WOOD, PLASTICS & COMPOSITES

Spec # Spec Name

06 10 00 – Rough Carpentry
## DIVISION 07 – THERMAL AND MOISTURE PROTECTION

<table>
<thead>
<tr>
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<tr>
<td>07 51 00</td>
<td>Built-Up Roofing System</td>
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<td>Flashing and Sheet Metal</td>
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<td>Skylights</td>
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<td>07 90 00</td>
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<td>Sealants and Caulking</td>
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## DIVISION 08 – OPENINGS

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<tr>
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<td>08 38 50</td>
<td>Sound Control Doors</td>
</tr>
<tr>
<td>08 71 00</td>
<td>Finish Hardware</td>
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## DIVISION 09 – FINISHES

<table>
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<tr>
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<tr>
<td>09 25 00</td>
<td>Gypsum Board</td>
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<tr>
<td>09 90 00</td>
<td>Architectural Painting</td>
</tr>
<tr>
<td>09 91 00</td>
<td>Shop Coating</td>
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<tr>
<td>09 92 00</td>
<td>Field Painting and Protective Coating</td>
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<tr>
<td>09 93 00</td>
<td>Petrolatum Tape and Petroleum Wax Tape Coatings</td>
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## DIVISION 10 – SPECIALTIES

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<tr>
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<td>10 22 00</td>
<td>Acoustical Metal Louvers</td>
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<tr>
<td>10 23 00</td>
<td>Non-Acoustical Metal Louvers</td>
</tr>
<tr>
<td>10 25 00</td>
<td>Fixed Glass Window System</td>
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<td>10 52 00</td>
<td>Fire Extinguishers</td>
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## DIVISION 11 – EQUIPMENT

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<tr>
<td>11 21 40</td>
<td>Vertical Turbine Pumps and Motors</td>
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<tr>
<td>11 26 20</td>
<td>Butterfly Valves</td>
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<tr>
<td>11 26 70</td>
<td>Resilient Wedge Gate Valves</td>
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<tr>
<td>11 28 20</td>
<td>Combination Air Vacuum and Air Release Valves</td>
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<tr>
<td>11 28 70</td>
<td>Pump Control Valves</td>
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<tr>
<td>11 28 80</td>
<td>Reduced-Pressure Principle Backflow Preventers</td>
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<tr>
<td>11 30 00</td>
<td>Electromagnetic Flow Meter</td>
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### DIVISION 15 – MECHANICAL

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<td>Hydropneumatic Surge Control Tank System</td>
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<tr>
<td>16 00 00</td>
<td>Electrical General Provisions</td>
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<tr>
<td>16 11 00</td>
<td>Raceways, Boxes, Fittings and Supports</td>
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<tr>
<td>16 12 00</td>
<td>Wires and Cables (600 Volt Maximum)</td>
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<td>16 14 10</td>
<td>Wiring Devices</td>
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<td>16 19 10</td>
<td>Miscellaneous Electrical Material and Equipment</td>
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<td>16 20 00</td>
<td>Temporary Power and Control Systems</td>
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<td>16 50 00</td>
<td>480/277 Volt Switchboard</td>
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<td>16 60 00</td>
<td>Motor Control Center</td>
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<tr>
<td>16 70 00</td>
<td>Grounding</td>
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<tr>
<td>16 70 50</td>
<td>Standby Diesel Engine Power Generator Set − 480 VAC</td>
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<tr>
<td>16 80 00</td>
<td>Automatic Transfer Switches</td>
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<tr>
<td>16 90 00</td>
<td>Control Cabinet and Controls</td>
</tr>
<tr>
<td>16 95 00</td>
<td>Modifications to Existing Electrical Components</td>
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<tr>
<td>16 96 00</td>
<td>Electrical System Testing</td>
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<tr>
<td>16 96 10</td>
<td>Short-Circuit Fault Current, Protective Device Coordination, and Arc Flash Studies</td>
</tr>
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### DIVISION 17 – INSTRUMENTATION AND SCADA

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<tr>
<th>Spec #</th>
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<tr>
<td>17 40 00</td>
<td>Field Instrumentation</td>
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<tr>
<td>17 41 00</td>
<td>Control Loop Descriptions</td>
</tr>
<tr>
<td>17 50 00</td>
<td>SCADA System</td>
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</table>
APPENDICES

Appendix A – Record Drawings of Existing Facilities
Appendix B – City Water Standards
Appendix C – City Road Design and Standards
Appendix D – Project Identification Sign
Appendix E – Sample Drawing for Loop Diagram
SECTION 01 11 00

SUMMARY OF WORK

1.01 GENERAL

The Work to be performed under this Contract shall consist of furnishing all plant, tools, equipment, materials, supplies, and manufactured articles for the Project. It shall also include the furnishing of all transportation and services, including fuel, power, water, and essential communications, and for the performance of all labor, work, or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work comprises of demolition and modifications of existing components, construction of new pump station, construction of new standby diesel generator at the pump station site, and construction of new water distribution pipeline involving civil, electrical, mechanical, structural, instrumentation, control, and SCADA works.

Demolition and modifications include steel piping, electrical and communication conduits, asphalt pavement, concrete curb, concrete gutter, irrigation system, antenna pole, radio system, steel tank cathodic protection system, aboveground and belowground boxes, landscaping, trees, instruments, and miscellaneous items.

Construction of new pump station facility at the La Granada Reservoir site includes installation of two 480VAC 50HP pumps, one 480VAC 300HP fire pump, 6 inches through 24 inches steel yard piping, approximately 850 feet of 18-inch pump welded steel discharge pipe, 14-inch reservoir inlet/outlet pipeline assembly modifications, isolation and control valves, surge tank, Southern California Edison service line and transformer, electrical switchboard, MCC, ATS, control cabinet, lighting, instruments, controls, electrical and communication conduits, communication system, SCADA (Supervisory Control and Data Acquisition) system, masonry building, air compressor, air piping, concrete curb and gutter, irrigation system, asphalt paving, replacement of existing chain link fence and gates, and miscellaneous civil, concrete, masonry, and metal work.

New standby diesel generator set to be installed at the La Granada Reservoir site includes installation of diesel-powered standby generator, sub-base fuel tank, sound attenuating enclosure, concrete foundation, electrical and communication systems, appurtenances, and site improvements.
New water distribution pipeline along La Granada Drive includes installation of approximately 2,800 feet of belowground 10-inch PVC pipeline, fittings, valves, pipe appurtenances, connections to existing pipelines, fire hydrants, air-vac valves, blow-off assembly, and associated work.

B. Locations of Work:

1. Pump station and standby diesel generator sites are located at the existing La Granada Reservoir facility near Mountain Crest Circle cul-de-sac in the City of Thousand Oaks. A portion of the 18-inch pump discharge piping and SCE service conduits are located along La Granada Reservoir access road, within approximately 10-foot wide City-owned trail between Mountain Crest Circle and North Conejo School Road, and in the public right-of-way along North Conejo School Road near its junction with Ranch View Place.

2. Ten-inch water distribution piping is to be constructed along La Granada Drive between Erbes Road and Hood Drive in the City of Thousand Oaks.

1.03 BEGINNING AND COMPLETION OF THE WORK

A. Time is the essence of the Contract. In accordance with the provisions of Article 2 of the Agreement, the Contractor shall commence the Work on the date specified in the written Notice to Proceed from the City, and shall furnish sufficient forces and equipment, including extra shifts and overtime, to prosecute all of the Work included in the Contract within 365 calendar days after the commencement date specified in the Notice to Proceed. There are intermediate completion milestones that contractor is required to comply with (see Sub-Section 1.15 “ALLOWABLE SCHEDULE OF WORK ITEMS”). Time stated for completion shall include completion of the punch list items and final cleanup of the premises.

B. The schedule shall allow enough time for inclement weather. Contractor shall include and factor in for a total of 10 lost days due to inclement weather and/or rain within the base 365 calendar days’ schedule duration of the project. No request for an extension of contract time due to such weather delays will be considered until the actual number of such inclement weather days exceeds 10 days. The Construction Schedule required by the General Requirements shall also include the milestone deliverables per this section.

1.04 CONTRACT METHOD

A. The Work hereunder will be constructed under a single prime contract. The contract will be based on as lump sum prices and unit prices in accordance with the Bid Schedules.
B. The Contractor shall include the requirements of the General Conditions and Special Conditions of the Contract as a part of all its subcontract agreements.

1.05 ORDER OF THE WORK

The Work shall be carried on at such places on the project and in such order or precedence as may be found necessary by the City to expedite completion of the Project. After work has begun on any portion of a designated part of the Project, it shall be carried forward to its completion as rapidly as practicable. The order and time to complete shall conform to the requirements of the approved Contractor's schedule as submitted under the provisions for "CPM Contractor Schedule" and "Contractor Submittals."

1.06 WORK BY OTHERS

A. General: The Contractor's attention is directed to the fact that work may be conducted at the site by other contractors during the performance of the Work under this Contract. The Contractor shall conduct its operations so as to cause a minimum of interference with the Work of such other contractors, and shall cooperate fully with such contractors to provide continued safe access to their respective portions of the site, as required to perform their respective contracts.

B. Interference with Work on Utilities: The Contractor shall cooperate fully with all utility forces of the City or forces of other public or private agencies engaged in the relocation, altering, or otherwise rearranging of any facilities which interfere with the progress of the Work and shall schedule the Work so as to minimize interference with said relocation, altering, or other rearranging of facilities.

C. Concurrent Work by Other Contractors: The Contractor's attention is directed to the fact that work may be conducted adjacent to the site by other contractors during the performance of the Work of this Contract. The Contractor shall conduct and coordinate its operations to cause a minimum of interference with the work of such other contractors. Example of such required coordination shall be during the La Granada pipeline construction and the roadway pavement overlay work (by other contractors) that will follow immediately upon completion of the pipeline.

1.07 WORK SEQUENCE

A. Duration: The total duration for the work shall be **365 calendar days** (which includes 10 Rain/Inclement Weather days as well as all holidays that fall within that overall duration, no additional contract time will be granted to the contractor unless the actual amount of inclement weather days exceeds the specified allocation.). There are also intermediate completion milestones that contractor is required to comply with (see Sub-Section 1.15 “ALLOWABLE SCHEDULE OF WORK ITEMS”).
B. Coordination:

1. Contractor to coordinate final work hours and access for each private property where the Contract Drawings show work to be performed.

2. Contractor shall coordinate with City’s project manager and inspector daily, including all schedule changes.

3. Contractor is required to submit 3-week lookahead schedules at each weekly progress meeting or as otherwise directed.

C. Performance: It shall be the sole responsibility of the Contractor to schedule the implementation of the Work to meet the Project Milestones.

D. Sequence: Construction/Work sequence shall be the Contractor’s responsibility, except as noted below and on the Drawings:

1. Potholing:
   
a. Potholing of existing utilities and submittal of pothole report shall be performed prior to submitting final shop drawings of materials, including pipeline, drain pipe, and conduits.

   b. Alignment of new underground utilities, including pipelines, drains, and conduits, shall be adjusted as required and their final shop drawings shall be prepared based on the pothole report and as approved by the Engineer.

   c. See Section 02 01 00 for additional potholing requirements.

2. No demolition work affecting operations of the existing components to remain in operation shall be performed until temporary power and control systems have been established, except as allowed in accordance with Section 16 20 00.

3. Prior to shutdown of the existing 14-inch La Granada Reservoir inlet-outlet to facilitate construction of new 18-inch pump discharge pipe and SCE conduit, modifications to the existing 14-inch La Granada Reservoir inlet-outlet shall be complete. This shall include, but is not limited to, complete installation of new 14-inch in-line isolation valve, blow-off assembly, air-vac assembly, testing, disinfection, and associated site improvements as shown on the Drawings and as required.

4. Existing SCE 120/240 VAC electrical service and associated components shall not be removed until new electrical service and new 120/240 VAC panel board is operational and accepted by the City.
5. Existing radio communication system shall not be removed until new communication system through Frontier is in operation and accepted by the City.

6. New asphalt pavement and slurry seal shall be installed after demobilization of all heavy equipment and vehicles.

7. Testing of new fire pump shall not be done until new 10-inch water pipeline along La Granada Drive is operational and accepted by the City.

8. Work shall be performed in accordance with the specified “Allowable Schedule of Work Items” in Paragraph 1.15.

1.08 CONSTRUCTION HOURS AND ACCESS

A. The Contractor is advised that City Hall is closed on alternating Fridays, and as such, City staff and its services are not available on those particular dates. The Contractor shall schedule any and all work requiring City staff and services, including inspection, to occur outside of those alternating Fridays. A schedule of City Hall hours may be obtained from City Hall or at the City’s website www.toaks.org.

B. Access to the sites is limited to the hours of 7:00 A.M. to 5:00 P.M., Monday through Friday. Saturday work may be approved in advance by the Project Representative. No work of any nature shall commence in any area outside of the specified work hours. This includes delivery, loading, unloading, and starting or moving of construction equipment.

C. Hours of work of the City’s Inspector and Project Representative are from 7:00 A.M. to 4:00 P.M. Monday through Thursday, and 7:00 A.M. to 3:30 P.M. every other Friday.

1. All costs of inspection and testing performed by the City or its authorized representatives outside the specified “hours of work”, or all day on Saturdays, Sundays, and City of Thousand Oaks legal holidays or the dates listed below in Items D and E, which is allowed solely for the convenience of the Contractor shall be borne by the Contractor at the City’s standard overtime rates.

2. All additional work hour requests shall be considered at the sole discretion of the City based on factors such as availability and community impact. The City shall have the authority to deduct the cost of all such inspection and testing from any partial payments otherwise due the Contractor.
D. No Sunday work will be approved during this Contract, except work considered to be an emergency as determined by the City. The Contractor shall request written authorization from the Project Representative in advance.

E. The City of Thousand Oaks legal holidays are: January 1, New Year’s Day; Third Monday in January, observance of Martin Luther King’s birthday; Third Monday in February, observance of Washington’s Birthday; Last Monday in May, observance of Memorial Day; July 4, Independence Day; First Monday in September, observance of Labor Day; November 11, Veterans’ Day; Fourth Thursday in November, Thanksgiving Day; Friday following Thanksgiving Day, and December 25, Christmas Day. Fixed day holidays are observed on Fridays if they fall on a Saturday or Mondays if they fall on a Sunday. Unless otherwise declared, City Hall will be closed between Christmas Day and New Year’s Day.

1.09 SURVEY

A. Available design survey information is shown on the Drawings.

B. It shall be the responsibility of the Contractor to provide construction survey and maintain and preserve all stakes.

1.10 CONTRACTOR USE OF PROJECT SITE

The Contractor's use of the project site shall be limited to its construction operations, including on-site storage of materials, on-site fabrication facilities, and field offices.

1.11 CITY USE OF THE PROJECT SITE

The City will utilize all or parts of the existing site and facilities during the entire period of the construction stage for conducting the City's normal operations. The Contractor shall cooperate with the City Engineer to minimize interference with the Contractor's operations and to facilitate the City's operations. In any event, the City, the Engineer, and their authorized representatives shall be allowed access to the project site at all times during the period of construction.

1.12 PARTIAL UTILIZATION OF THE WORK BY CITY

A. The City will utilize the new 10-inch water distribution pipeline and associated components upon completion.

B. The City will utilize the 14-inch La Granada Reservoir inlet-outlet after completion of required modifications.

C. The Contractor is hereby advised that the City will accept the responsibility for the maintenance and protection of the specific portion of the project so used.
The Contractor shall, however, retain full responsibility for satisfactory operation of the total project.

1.13 NOTICES TO PROPERTY OWNERS OR BUSINESSES

A. The Contractor shall provide written notices to the City, property owners, and business owners who might be affected by the Contractor’s operations seven days in advance of the construction operations. This includes, but is not limited to, excavation, trenching, pipeline installation, traffic controls, pavement repairs and improvements, slurry placement on ac pavement, road improvements and repair work, etc.

B. All written notices shall be submitted to the City well in advance for review and approval prior to sending them out to the property and business owners.

C. The Contractor shall submit a schedule and map of areas showing affected property and business owners by the proposed construction to the Engineer for review and approval.

D. Construction shall not begin until proper notice has been posted for a minimum of seven calendar days.

E. Additional requirements may be specified in other Sections and shall be met by the Contractor.

1.14 EXISTING FACILITY SHUTDOWN SCHEDULE

A. General: Shutdown of City’s facilities shall be performed by City personnel only. The Contractor shall not operate any valves or perform any work that affects the current operating condition of City facilities. The Contractor shall provide a written request addressed to the City at least 7 Calendar Days prior to the requested facility shutdown. Failure of the Contractor to provide the proper advance written request may result in not obtaining the Contractor's desired date of shutdown. Failure of the Contractor to properly notify the City for the shutdown will not result in the granting of extra work.

B. Existing La Granada Reservoir Inlet-Outlet Pipeline Shutdown:

1. Existing 14-inch La Granada Reservoir inlet-outlet pipe between the reservoir and first available isolation valve in North Conejo School Road will be shutdown to facilitate construction of new 14-inch in-line valve and associated components in Mountain Crest Circle cul-de-sac.

2. After installation of the new 14-inch in-line valve and associated components for the reservoir inlet-outlet, the inlet-outlet between newly installed in-line valve and reservoir will be shutdown to facilitate construction
of 18-inch pump discharge pipe, SCE 5-inch electrical conduits, and Frontier communication system along the paved reservoir access road and at the La Granada Reservoir site.

3. Unless otherwise approved, shutdown of existing reservoir inlet-outlet will be allowed once for 24 calendar days to perform work described in 1.14.B.1 and 1.14.B.2. All work including 18-inch pipe and the conduits installation, weld testing, chlorination, pressure testing, and trench backfilling shall be complete within allowable shutdown period. Work that is not required to keep trench open need not be completed within shutdown period. Refer to Paragraph 1.15, “Allowable Schedule of Work Items” for additional requirements.

4. All pipeline and conduit materials to be installed during the reservoir inlet-outlet shutdown shall be delivered to the site prior to start of the reservoir inlet-outlet shutdown.

C. Existing Hiking Trail Shutdown/Closure:

1. The existing hiking/equestrian trail along the reservoir access road and through the 10-wide strip of land owned by the City:
   a. Shall remain open to public at all times, except for a two-time temporary closure:
      i. One closure for a period not to exceed 20 calendar days for the pipeline construction work along the access rd.
      ii. One closure for a period not to exceed 30 calendar days for access road curb/gutter and new asphalt/concrete pavement construction.
   b. When open to public (at all times during construction, with the exception of temporary closure periods), the Contractor shall provide a minimum 8-foot wide access/path for trail users along the reservoir access road that:
      i. Uses part of the access road or the shoulder area of the access road re-graded by the Contractor to accommodate users.
      ii. Is closed off/delineated/separated by the Contractor furnishing, installing, and maintaining temporary chain link fence or k-rails along the access road.
      iii. Is maintained clean and free of construction debris by the Contractor.

2. During construction work along 10-foot wide strip of land, Contractor shall provide trail users a detour through Mountain Crest Cir.
3. Contractor shall furnish and install up six signs indicating: “temporary closure of the hiking trail”, “Construction Area-Do Not Enter”, “Caution – Construction Zone”, etc.

4. Two weeks prior to each time the Trail will be closed to public, Contractor shall notify the City and have appropriate sings installed per City’s direction.

5. The language for signs and installation locations shall be approved by the City.

6. Sign shall be comprised of at least 2’ x 3’ sturdy material with 2" high letters mounted on a post and embedded in a secure manner in to solid ground. Colors for background and letters shall be as determined by the City.

7. Contractor shall properly install and maintain the signs during the project. Signs shall be removed after they are no longer required, and surface shall be repaired and brought to original condition.

1.15 ALLOWABLE SCHEDULE OF WORK ITEMS

A. The Work is divided into six major items as listed below.

1. 10-Inch Water Pipeline along La Granada Drive.

2. 14-Inch La Granada Reservoir Inlet-Outlet Modifications Requiring Existing Reservoir 14-Inch Inlet-Outlet to be Out of Service.

3. 14-Inch La Granada Reservoir Inlet-Outlet Modifications Not Requiring Existing Reservoir 14-Inch Inlet-Outlet to be Out of Service.

4. 18-Inch Pump Discharge Pipe, SCE Facilities, and Frontier Communication System Work Requiring Existing Reservoir 14-Inch Inlet-Outlet to be Out of Service.

5. 18-Inch Pump Discharge Pipe, SCE Facilities, and Frontier Communication System Work Not Requiring Existing Reservoir 14-Inch Inlet-Outlet to be Out of Service.

6. All Other Items, including La Granada Pump Station, Standby Generator, Reservoir Access Road, and Miscellaneous Work Items.
B. Allowable Schedule for each Work Item shall be as follows:

<table>
<thead>
<tr>
<th>Work Item</th>
<th>Allowable Earliest Start Date</th>
<th>Allowable Latest Completion Date</th>
<th>Maximum Days to Complete Work After Start of Any Field Work</th>
<th>Notes</th>
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<tbody>
<tr>
<td>10-Inch Water Pipeline Along La Granada Drive</td>
<td>Issuance of the Notice to Proceed</td>
<td>July 18&lt;sup&gt;th&lt;/sup&gt;</td>
<td>75 Calendar days</td>
<td>(a), (h)</td>
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<td>14-Inch La Granada Reservoir Inlet-Outlet Modifications Requiring Existing Reservoir 14-Inch Inlet-Outlet to be Out of Service.</td>
<td>Issuance of the Notice to Proceed</td>
<td>Open</td>
<td>4 Calendar days</td>
<td>(b), (g), (h)</td>
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<tr>
<td>14-Inch La Granada Reservoir Inlet-Outlet Modifications Not Requiring Existing Reservoir 14-Inch Inlet-Outlet to be Out of Service.</td>
<td>Issuance of the Notice to Proceed</td>
<td>Open</td>
<td>Not Applicable</td>
<td>(c), (g)</td>
</tr>
<tr>
<td>18-Inch Pump Discharge Pipe, SCE Facilities, and Frontier Communication System Work Requiring Existing Reservoir 14-Inch Inlet-Outlet to be Out of Service. (Along the Access Road)</td>
<td>Right After Completion of Item 2</td>
<td>Open</td>
<td>20 Calendar days</td>
<td>(d), (g)</td>
</tr>
<tr>
<td>18-Inch Pump Discharge Pipe and SCE Facilities Work Not Requiring Existing Reservoir 14-Inch Inlet-Outlet to be Out of Service. (Along the 10-foot strip of land)</td>
<td>Issuance of the Notice to Proceed</td>
<td>Open</td>
<td>55 Calendar days</td>
<td>(e), (g)</td>
</tr>
<tr>
<td>La Granada Pump Station, Standby Generator, Reservoir Access Road, and All Other Items.</td>
<td>Issuance of the Notice to Proceed</td>
<td>Open</td>
<td>Not Applicable</td>
<td>(f)</td>
</tr>
</tbody>
</table>

Notes for Allowable Schedule:

(a) Potholing work will not be considered part of 75 days field work allowed for the pipeline construction. The new pipeline installation, chlorination, testing, trench backfill, and surface restoration, and all
work pertaining to 10-inch water pipeline as part of Bid Schedule B may start right after the issuance of the notice to proceed and shall be fully completed by July 18th, however the following strict work hours apply:

1) Monday thru Friday 8:30 am to 2:00 pm thru June 7th (while school in session) – Saturday work may be approved from 7 am to 5 pm.

2) Monday Thru Friday 7:00 am 5:00 pm June 8th thru July 18th (during school recess) – Saturday work may be approved from 7 am to 5 pm.

(b) All work pertaining to existing 14-inch La Granada Reservoir inlet-outlet modifications requiring the existing 14-inch La Granada Reservoir inlet-outlet to be out of service shall be complete, including applicable work items listed in Bid Schedule C, excepting “Pavement Repair & Slurry Seal”.

(c) All work pertaining to existing 14-inch La Granada Reservoir inlet-outlet modifications shall be complete, including applicable work items listed in Bid Schedule C.

(d) All work pertaining to existing 18-Inch pump discharge pipe, SCE conduits, and Frontier communication system requiring the existing 14-inch La Granada Reservoir inlet-outlet to be out of service shall be complete. This shall include construction of new pipeline and conduit system, including applicable items in Bid Schedule C, including pipe placement, weld testing, trench backfilling, at a minimum, from the La Granada Reservoir site to end of the reservoir access road. During this construction period, existing 14-inch reservoir inlet-outlet will be out of service.

(e) All work pertaining to existing 18-Inch pump discharge pipe, SCE facilities, and Frontier communication system shall be complete, including all applicable work items listed in Bid Schedules C. The Access Road and the 10-foot strip of land are considered equestrian trail and shall not be closed to public with the exceptions listed under 1.14-C of this Section. All work under Bid Schedule C applicable to the new 18-inch line, SCE facilities, and Frontier communication system shall be completed.

(f) All other work that is not listed in Items 1 through 5, including La Granada pump station, standby generator, reservoir site access road, and miscellaneous work items shall be complete within the specified schedule.
(g) Work for these items shall be performed between 8:00 A.M. and 5:00 P.M.

(h) Any work requiring the City’s water system shut down or La Granada Reservoir going off line (out of service) for any length of time, requires at least three calendar days advance notice by Contractor to the City.

C. For each calendar day in excess of the time specified in the Table above for Allowable Schedule for Each Work Item for completion of the work, the Contractor shall pay to the City $1500 per day, as liquidated damages and not as a penalty or forfeiture.

1.16 PORTABLE CHANGABLE MESSAGE SIGNS (PCMS):

A. For construction of the 10-inch pipeline along La Granada Drive, at least two Portable Changeable Message Signs shall be furnished, installed and maintained by the contractor. The signs shall be properly installed at locations approved by the City along La Granada Drive and operated at least two weeks prior to start any filed work through the completion of all work under Bid Schedule B.

B. See Section 01 55 26 for additional requirements.

1.17 PERMITS

A. Groundwater may be encountered during excavation, in which case, Contractor is responsible for the proper disposal of dewatering including applying and obtaining the necessary NPDES permits.

B. Contractor shall obtain City Encroachment Permit (no fee) for working within the City right of way, and shall comply with all conditions of the permit.

END OF SECTION
1.01 SCOPE

A. Payment for the various items of the Bid Sheets/Schedules, as further specified herein, shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items of work being described, as necessary to complete the various items of work as specified and shown on the drawings, including all appurtenances thereto, and including all costs of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the California Division of Industrial Safety and the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Sheet(s), and all costs therefor shall be included in the prices named in the Bid Sheet(s) for the various appurtenant items of work.

B. If no separate bid item is provided for any portion of the Work, the price thereof shall be considered to be included in the bid item that most closely applies to that portion of the Work.

C. Unit Price:

1. All pay line items will be paid for at the unit prices named in the Bid Sheets for the respective items of work. The quantities of work or material stated as unit price items on the Bid Sheets are supplied only to give an indication of the general scope of the Work; the City does not expressly, or by implication, agree that the actual amount of work or material will correspond therewith, and reserves the right after award to increase or decrease the quantity of any unit price item of work by an amount up to and including 25 percent of any bid item, without a change in the unit price, and shall have the right to delete any bid item in its entirety, or to add additional bid items up to and including an aggregate total amount not to exceed 25 percent of the contract price.

2. Quantity variations in excess of the allowable quantity changes specified herein shall be subject to the provisions of Article 43 of the General Conditions.
D. Lump Sum Price:

1. Bid items with lump sum prices will be paid for at the lump sum price named in the Bid Sheets for the respective items of work.

2. For lump sum bid items, detailed Schedule of Values giving an itemized breakdown of the price shall be provided in accordance with Article 39 of the General Conditions. Unless otherwise noted, City-approved Schedule of Values will be used for progress payments per Article 39 of the General Conditions.

PART 2 - PAYMENT SCHEDULE

2.01 BID SCHEDULE A – PROJECT MOBILIZATION/SIGNAGE

A. MOBILIZATION (Bid Item No. 1)

1. Measurement for payment for mobilization will be based upon completion of such work as a lump sum, non-proratable pay item, and shall require completion of all of the listed items during the first 25 days following Notice to Proceed.

2. Payment for Mobilization will be made at the lump sum allowance named in the Bid Schedule, which price shall constitute full compensation for all such work. Payment for mobilization will be made in the form of a single, lump sum, non-proratable payment, no part of which will be approved for payment under the Contract until all mobilization items listed herein have been completed as specified. The scope of the work for Mobilization includes all items listed in Article 40 of the General Conditions and shall include, but is not limited to, the obtaining of all bonds, insurance, and permits, moving onto the site of all plant and equipment, the furnishing and erecting of plants, storage yards, temporary buildings, temporary utilities and other construction facilities, presence of full time superintendent at the site, and securing approval of the Initial Construction Schedule, and other items as required for the proper performance and completion of the Work.

3. In addition to the requirements specified above, all submittals shall conform to the applicable requirements of Section entitled “Contractor Submittals.”

4. No payment for any of the listed mobilization work items will be made until all of the listed items have been completed to the satisfaction of the Engineer.
5. The aforementioned amount will be retained by the City as the agreed, estimated value of completing all of the mobilization items listed. Any such retention of money for failure to complete all such mobilization items as a lump sum item shall be in addition to the retention of any payments due to the Contractor as specified in Articles 41 & 42 of the General Conditions.

B. PROJECT SIGNS & Trail Delineation Work (Bid Item No. 2)

1. Work under this Bid Item includes designing, furnishing, and getting approval, and installing:
   i. Three project identification signs (per Section 01 58 00 and Project sing Appendix)
   ii. Hiking/Equestrian Trail Signs and Delineation/Closure work (per Section 01 11 00, Sub-Section 1.14C).

Project signs under this Bid Item shall be furnished and install at locations indicated and approved by the City. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the lump sum price therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.

2.02 BID SCHEDULE B - 10-INCH WATER PIPELINE ALONG LA GRANADA DRIVE

A. EROSION & POLLUTION CONTROL BMP’S (Bid Item No. 3)

1. Measurement for payment of erosion and pollution control compliance for 10-inch water pipeline construction along La Granada Drive will be based upon the preparation, implementation and compliance with an erosion control plan for the 10-inch water pipeline project site. Modification to the erosion control plan or additional control items required by the Owner will be at no additional cost. This item is to include all equipment, materials, labor, and maintenance necessary to control storm water pollution and erosion/dust control. This item consists of the completion of all planning, design, engineering, furnishing, installing, construction and the removal and disposal of all such temporary erosion and dust control BMP’s as a lump sum item, complete, as required under the provisions of any permits, and in accordance with the requirements of California Construction General Permit No. CAS000002 (State Water Resources Control Board (SWRCB) Orders No. 2009-009-DWQ as amended by Order 2010-0014-DWQ and No. 2012-0006-DWQ of the Construction General Permit.

2. Payment to be made under this bid item shall be for erosion and pollution control compliance, including preparation of the erosion control plan, and
any mitigation required, complete in place, and will be made at the lump sum price named in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.

3. Payment of 20% of the Bid Item price shall be made upon submittal, approval and deployment of the erosion control plan BMP’s. Payment of 70% of the Bid Item price shall be made in equal installments for implementation of the erosion control plan. Payment of the final 10% of the Bid Item price shall be paid upon satisfactory removal of the erosion control items when final stabilization has been achieved.

B. UTILITY POTHOLING (Bid Item No. 4)

1. Work under this Bid Item includes marking and potholing existing belowground utilities that may interfere with new construction and cross new pipelines, submitting detailed pothole reports, revising shop drawings of affected new pipelines and facilities, and coordinating with Dig Alert, utility companies, and owners of underground facilities. The work also includes temporary traffic control, including planning, design, obtaining permits from City, engineering, furnishing, construction, maintenance and removal/disposal of all traffic control for potholing work. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.

C. TRAFFIC CONTROL (Bid Item No. 5)

1. Work under this Bid Item includes planning, design, obtaining permits from the City, engineering, furnishing, construction, maintenance and removal/disposal of all traffic control required for complete construction of 10-inch pipe along La Granada Drive, including pipeline testing and pavement repair, and all other associated work. All work shall be complete and in accordance with the Contract Documents including Specification Section 01 55 26, the provisions of any permits, and in accordance with the City Traffic Engineer’s requirements.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.
D. CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT (Bid Item No. 6)

1. Work under this Bid Item includes preparing, submitting, and implementing construction and demolition (C&D) waste management plan, recycling and disposal of non-hazardous demolition and construction waste, submitting C&D recycling reports, submitting recycling and processing facility records, and submitting landfill and incinerator disposal records involved in construction of 10-inch pipe along La Granada Drive and all associated work. All work shall be complete and in accordance with the Contract Documents, including Specification Section 01 74 19.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

E. SHEETING, SHORING, AND BRACING OR EQUIVALENT METHOD (Bid Item No. 7)

1. Measurement for payment for temporary sheeting, shoring, and bracing or equivalent method will be based upon the completion of all planning, design, engineering, furnishing, and construction and the removal and disposal of all such temporary sheeting, shoring, and bracing for construction of 10-inch pipe system along La Granada Drive and associated work, as required under the provisions of any permits, and in accordance with the requirements of OSHA and the Construction Safety Orders of the State of California, pursuant to the provisions of Section 6707 of the California Labor Code. All work shall be complete and in accordance with the Contract Documents, including Specification Section 02 40 00.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

F. 10-INCH WATER PIPELINE (Bid Item No. 8)

1. Work under this Bid Item includes complete installation of 10-inch pipeline, fittings, appurtenances, and all other associated work, excepting work items which are covered under separate bid items. The work includes, but not limited to, earthwork, trenching, demolition, dewatering, installation of pipe, fittings, and appurtenances, protection of existing utilities and facilities, disposal of removed material, trench backfilling, placement of temporary pavement, testing of materials, and performing other pertinent tasks. All work shall be complete and in accordance with the Contract Documents.
2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

G. CONNECTIONS TO EXISTING PIPELINES (Bid Item No. 9)

1. Work under this Bid Item includes making complete connections between 10-inch pipeline and existing pipelines, including placing pipe, fittings, valves, appurtenances, and all other associated work, excepting work items which are covered under separate bid items. The work includes, but not limited to, earthwork, trenching, demolition, dewatering, hot tapping existing pipe, installation of new pipe, fittings, valves, and appurtenances, protection of existing utilities and facilities, disposal of removed material, trench backfilling, placement of temporary pavement, testing of materials, and performing other pertinent tasks. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

H. BLOW-OFF ASSEMBLIES (Bid Item No. 10)

1. Work under this Bid Item includes installation of complete blow-off assemblies for 10-inch pipeline in La Granada Drive, including placing pipe, fittings, valves, appurtenances, and all other associated work, excepting work items which are covered under separate bid items. The work includes, but not limited to, earthwork, trenching, demolition, dewatering, installation of new blow-off pipe, fittings, valves, and appurtenances, protection of existing utilities and facilities, disposal of removed material, trench backfilling, placement of temporary pavement, testing of materials, and performing other pertinent tasks. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

I. AIR VACUUM AND AIR RELEASE VALVES (AVARVs) ASSEMBLIES (Bid Item No. 11)

1. Work under this Bid Item includes installation of complete Air Vacuum and Air Release Valves (AVARVs) assemblies for 10-inch pipeline in La
Granada Drive, including placing pipe, fittings, valves, appurtenances, and all other associated work, excepting work items which are covered under separate bid items. The work includes, but not limited to, earthwork, trenching, demolition, dewatering, installation of new AVARV pipe, fittings, valves, and appurtenances, protection of existing utilities and facilities, disposal of removed material, trench backfilling, placement of temporary pavement, testing of materials, and performing other pertinent tasks. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

J. FIRE HYDRANT ASSEMBLIES (Bid Item No. 12)

1. Work under this Bid Item includes installation of complete fire hydrant assemblies for 10-inch pipeline in La Granada Drive, including placing pipe, fittings, valves, fire hydrant, appurtenances, and all other associated work, excepting work items which are covered under separate bid items. The work includes, but not limited to, earthwork, trenching, demolition, dewatering, installation of new fire hydrant pipe, fittings, valves, fire hydrant, and appurtenances, protection of existing utilities and facilities, disposal of removed material, trench backfilling, placement of temporary pavement, testing of materials, and performing other pertinent tasks. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

K. PAVEMENT REPAIR (Bid Item No. 13)

1. Work under this Bid Item includes all types of pavement repairs and improvements required after completion of 10-inch pipeline in La Granada Drive. The work includes, but not limited to, removal of temporary pavement if placed, placing aggregate base, fine grading, placing asphalt concrete, concrete pavement, and performing other pertinent tasks, as required. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.
L. PIPELINE CLEANING, DISINFECTION, AND TESTING (Bid Item No. 14)

1. Work under this Bid Item includes cleaning, hydrotesting, and disinfecting complete 10-inch pipeline system in La Granada Drive. The work includes, but not limited to, cleaning, hydrotesting, and disinfection pipeline, valves, and appurtenances, installing temporary devices as required, providing water, discharging water in a legal manner, submitting test results, repairing leaks if any, and performing other pertinent tasks, as required. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.

M. ROCK EXCAVATION AND REMOVAL (Bid Item No. 15)

1. Work under this Bid Item includes excavation and removal of rock if encountered during construction of 10-inch pipeline system in La Granada Drive. The work includes, but not limited to, excavating, removing, and disposing rocks encountered in trenches and excavated areas, submitting tickets showing net weight of removed rock, and performing other pertinent tasks, as required. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made if rock is encountered, excavated, and removed. Payment for this Bid Item will be made at the unit price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.

N. WORK CLOSEOUT – BID SCHEDULE “B” (Bid Item No. 16)

1. Work under this Bid Item includes closeout work for 10-inch pipeline system in La Granada Drive. The work includes, but not limited to, site cleanup, removal of temporary facilities, completion of punch list items, submitting completed site photos and videos, operation and maintenance manuals, warranties, test reports, as-built drawings, and performing other pertinent and applicable tasks specified in Section 01 77 00. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.
2.03  **BID SCHEDULE C - EXISTING 14-INCH RESERVOIR INLET-OUTLET MODIFICATIONS, 18-INCH DISCHARGE PIPELINE, AND SCE FACILITIES**

**A. DEFINITION OF WORK COMPONENTS:**

1. **14-Inch Reservoir Inlet-Outlet Modifications:**

   Major components of 14-inch reservoir inlet-outlet modifications to be included in this Bid Schedule are removal of existing 14-inch pipe, installation of new 14-inch piping, valves, and fittings and associated blow-off and AVARV assemblies.

2. **18-Inch Discharge Pipeline:**

   Major components of 18-inch pump discharge pipeline to be included in this Bid Schedule are the 18-inch steel pipe from connection to existing 12” pipe at Sta. 1+98.80 to Sta. 9+21.60 near La Granada pump station and associated blow-off and AVARV assemblies.

3. **SCE Facilities:**

   Major components of SCE facilities and associated work to be included in this Bid Schedule are as follows.

   a. New SCE conduit from new pull box in Conejo School Road to SCE new transformer at La Granada reservoir.

   b. Two new SCE conduits from SCE transformer at La Granada reservoir to incoming section of new switchgear inside La Granada pump station building.

   c. New SCE transformer facility, including transformer pad and slab box, concrete slab around transformer, retaining walls around transformer, and associated components.

   d. Removal of existing SCE 120/240 VAC service pedestal located on west side of reservoir access road. Removal of existing wires from existing 120/240 VAC service conduit from SCE service pedestal to existing panel board at La Granada reservoir and installing pull rope.

**B. EROSION & POLLUTION CONTROL BMP’S (Bid Item No. 17)**

1. Measurement for payment of erosion and pollution control compliance for Schedule C items will be based upon the preparation, implementation and compliance with an erosion control plan for the affected site. Modification to
the erosion control plan or additional control items required by the Owner will be at no additional cost. This item is to include all equipment, materials, labor, and maintenance necessary to control storm water pollution and erosion/dust control. This item consists of the completion of all planning, design, engineering, furnishing, installing, construction and the removal and disposal of all such temporary erosion and dust control BMP’s as a lump sum item, complete, as required under the provisions of any permits, and in accordance with the requirements of California Construction General Permit No. CAS000002 (State Water Resources Control Board (SWRCB) Orders No. 2009-009-DWQ as amended by Order 2010-0014-DWQ and No. 2012-0006-DWQ of the Construction General Permit.

2. Payment to be made under this bid item shall be for erosion and pollution control compliance, including preparation of the erosion control plan, and any mitigation required, complete in place, and will be made at the lump sum price named in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.

3. Payment of 20% of the Bid Item price shall be made upon submittal, approval and deployment of the erosion control plan BMP’s. Payment of 70% of the Bid Item price shall be made in equal installments for implementation of the erosion control plan. Payment of the final 10% of the Bid Item price shall be paid upon satisfactory removal of the erosion control items when final stabilization has been achieved.

C. UTILITY POTHOLING (Bid Item No. 18)

1. Work under this Bid Item includes marking and potholing existing belowground utilities that may interfere with new construction and cross new pipelines and conduits, submitting detailed pothole reports, revising shop drawings of affected new pipelines, conduits, and facilities, and coordinating with Dig Alert, utility companies, and owners of underground facilities. The work also includes temporary traffic control, including planning, design, obtaining permits from the City, engineering, furnishing, construction, maintenance and removal/disposal of all traffic control for potholing work. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.

D. TRAFFIC CONTROL (Bid Item No. 19)

1. Work under this Bid Item includes planning, design, obtaining permits from City, engineering, furnishing, construction, maintenance and removal/disposal of all traffic control required for complete construction of
Schedule C items, including pipeline and conduit construction, testing, pavement repair, and all other associated work. All work shall be complete and in accordance with the Contract Documents including Specification Section 01 55 26, the provisions of any permits, and in accordance with the City Traffic Engineer’s requirements.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

E. CONSTRUCTION AND DEMOILITION WASTE MANAGEMENT (Bid Item No. 20)

1. Work under this Bid Item includes preparing, submitting, and implementing construction and demolition (C&D) waste management plan, recycling and disposal of non-hazardous demolition and construction waste, submitting C&D recycling reports, submitting recycling and processing facility records, and submitting landfill and incinerator disposal records involved in construction of all Schedule C items, including pipelines, conduits, and associated components. All work shall be complete and in accordance with the Contract Documents, including Specification Section 01 74 19.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

F. SHEETING, SHORING, AND BRACING OR EQUIVALENT METHOD (Bid Item No. 21)

1. Measurement for payment for temporary sheeting, shoring, and bracing or equivalent method will be based upon the completion of all planning, design, engineering, furnishing, and construction and the removal and disposal of all such temporary sheeting, shoring, and bracing for construction of all Schedule C items, including pipelines, conduits, and associated work, as required under the provisions of any permits, and in accordance with the requirements of OSHA and the Construction Safety Orders of the State of California, pursuant to the provisions of Section 6707 of the California Labor Code. All work shall be complete and in accordance with the Contract Documents, including Specification Section 02 40 00.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.
G. 14-INCH RESERVOIR INLET-OUTLET MODIFICATIONS (Bid Item No. 22)

1. Work under this Bid Item includes removal of existing 14-inch pipe and fittings and installation of new 14-inch pipe, fittings, valves, appurtenances and all other associated work, excepting work items which are covered under separate bid items. The work includes, but not limited to, earthwork, trenching, demolition, dewatering, installation of pipe, fittings, valves, and appurtenances, protection of existing utilities and facilities, disposal of removed material, trench backfilling, placement of temporary pavement, testing of materials, and performing other pertinent tasks. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

H. 18-INCH PUMP DISCHARGE PIPE (Bid Item No. 23)

1. Work under this Bid Item includes installation of new 18-inch pump discharge pipe (from connection to existing 12” pipe at Sta. 1+98.80 to Sta. 9+21.60), fittings, valves, appurtenances and all other associated work, excepting work items which are covered under separate bid items. The work includes, but not limited to, earthwork, trenching, demolition, dewatering, installation of pipe, fittings, valves, and appurtenances, protection of existing utilities and facilities, hot tapping of existing pipe, disposal of removed material, trench backfilling, placement of temporary pavement, testing of materials, and performing other pertinent tasks. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

I. BLOW-OFF ASSEMBLIES (Bid Item No. 24)

1. Work under this Bid Item includes installation of complete blow-off assemblies for 14-inch reservoir inlet-outlet pipe and 18-inch discharge pipeline, including placing pipe, fittings, valves, appurtenances, and all other associated work, excepting work items which are covered under separate bid items. The work includes, but not limited to, earthwork, trenching, demolition, dewatering, installation of new blow-off pipe, fittings, valves, and appurtenances, protection of existing utilities and facilities, disposal of removed material, trench backfilling, placement of temporary
pavement, testing of materials, and performing other pertinent tasks. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

J. AIR VACUUM AND AIR RELEASE VALVES (AVARVS) ASSEMBLIES (Bid Item No. 25)

1. Work under this Bid Item includes installation of complete Air Vacuum and Air Release Valves (AVARVs) assemblies for 14-inch reservoir inlet-outlet pipe and 18-inch discharge pipeline, including placing pipe, fittings, valves, appurtenances, and all other associated work, excepting work items which are covered under separate bid items. The work includes, but not limited to, earthwork, trenching, demolition, dewatering, installation of new AVARV pipe, fittings, valves, and appurtenances, protection of existing utilities and facilities, disposal of removed material, trench backfilling, placement of temporary pavement, testing of materials, and performing other pertinent tasks. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

K. PIPELINE CLEANING, DISINFECTION, AND TESTING (Bid Item No. 26)

1. Work under this Bid Item includes cleaning and disinfecting 14-inch reservoir inlet-outlet modified pipelines and 18-inch discharge pipeline and associated blow-off and AVARV pipelines. The work includes dye penetration testing and hydrotecting of 18-inch discharge pipeline as applicable. The work includes hydrotecting of blow-off pipelines, and AVARV pipelines. The work also includes installing temporary devices as required, providing water, discharging water in a legal manner, submitting test results, repairing leaks if any, and performing other pertinent tasks, as required. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.
L. ROCK EXCAVATION AND REMOVAL (Bid Item No. 27)

1. Work under this Bid Item includes excavation and removal of rock if encountered during construction of Schedule C Items. The work includes, but not limited to, excavating, removing, and disposing rocks encountered in trenches and excavated areas, submitting tickets showing net weight of removed rock, and performing other pertinent tasks, as required. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made if rock is encountered, excavated, and removed. Payment for this Bid Item will be made at the unit price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.

M. REMOVE EXISTING ABANDONED 14-INCH PIPE (Bid Item No. 28)

1. Work under this Bid Item includes removal of existing abandoned slurry filled 14-inch water pipe if interfering with construction of new 18-inch pump discharge pipe and SCE facilities. The work includes, but not limited to, excavating, removing, and disposing existing slurry filled 14-inch pipe, fittings and appurtenances interfering with new construction as required. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made if existing pipe is interfering with new construction and required to be removed. Payment for this Bid Item will be made at the unit price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.

N. REMOVE EXISTING ABANDONED 6-INCH AND SMALLER PIPELINES AND CONDUITS (Bid Item No. 29)

1. Work under this Bid Item includes removal of existing abandoned 6-inch and smaller pipes and conduits if interfering with construction of new 18-inch pump discharge pipe and SCE facilities. The work includes, but not limited to, excavating, removing, and disposing existing pipes and conduits and appurtenances interfering with new construction as required. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made if existing pipe or conduit is interfering with new construction and required to be removed. Payment for this Bid Item will be made at the unit price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.
O. SCE CONDUITS (Bid Item No. 30)

1. Work under this Bid Item includes installation of new SCE conduits, fittings, pull boxes, appurtenances, and all other associated work, excepting work items which are covered under separate bid items. The work includes, but not limited to, earthwork, trenching, demolition, dewatering, installation of conduit system, protection of existing utilities and facilities, disposal of removed material, trench backfilling, placement of temporary pavement, testing of materials, and performing other pertinent tasks. All work shall be complete and in accordance with the Contract Documents and as required by SCE.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

P. SCE TRANSFORMER FACILITY (Bid Item No. 31)

1. Work under this Bid Item includes installation of SCE transformer facility, including transformer pad and slab box, concrete slab around transformer, retaining walls around transformer, and associated components. The work includes, but not limited to, earthwork, excavation, backfill, demolition, dewatering, masonry work, concrete work, protection of existing utilities and facilities, disposal of removed material, and performing other pertinent tasks. All work shall be complete and in accordance with the Contract Documents and as required by SCE. Transformer will be furnished and installed by SCE.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

Q. REMOVAL OF EXISTING SCE FACILITY AND SERVICE WIRES (Bid Item No. 32)

1. Work under this Bid Item includes Removal of existing SCE 120/240 VAC service pedestal located on west side of reservoir access road, removal of existing wires from existing 120/240VAC service conduit from SCE service pedestal to existing panel board at La Granada reservoir and installing pull rope inside the same aforementioned existing conduit. All work shall be complete and in accordance with the Contract Documents and as required by SCE. Pavement improvements for the reservoir access road will be paid under separate Bid Item as noted herein.
2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

R. PAVEMENT REPAIR AND SLURRY-SEAL IN PUBLIC STREETS (Bid Item No. 33)

1. Work under this Bid Item includes all types of pavement repairs, pavement improvements, and slurry-seal required in Mountain Crest Circle cul-de-sac after completion of 14-inch reservoir inlet-outlet modifications and in Conejo School Road after completion of 18-inch pump discharge pipe and SCE facilities. The work includes, but not limited to, removal of temporary pavement if placed, placing aggregate base, fine grading, placing asphalt concrete, concrete pavement, and performing other pertinent tasks, as required. The work also includes placement of slurry-seal after completion of pavement repair and improvements. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

S. WORK CLOSEOUT - Bid Schedule “C” (Bid Item No. 34)

1. Work under this Bid Item includes closeout work for Bid Schedule C items. The work includes, but not limited to, site cleanup, removal of temporary facilities, completion of punch list items, submitting completed site photos and videos, operation and maintenance manuals, warranties, test reports, as-built drawings, and performing other pertinent and applicable tasks specified in Section 01 77 00. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.

2.04 BID SCHEDULE D - LA GRANADA PUMP STATION AND STANDBY GENERATOR

A. LA GRANADA PUMP STATION AND STANDBY GENERATOR WORK:

In general, all work to be performed within the existing La Granada Reservoir property is included in this Bid Item, except portion of 18-inch pump discharge
pipe and SCE conduits, SCE transformer facilities, asphalt pavement improvement, concrete curb and gutter improvement, and associated work, which are covered under other bid items.

B. EROSION & POLLUTION CONTROL BMP’S (Bid Item No. 35)

1. Measurement for payment of erosion and pollution control compliance for Schedule D items will be based upon the preparation, implementation and compliance with an erosion control plan for the affected site. Modification to the erosion control plan or additional control items required by the Owner will be at no additional cost. This item is to include all equipment, materials, labor, and maintenance necessary to control storm water pollution and erosion/dust control. This item consists of the completion of all planning, design, engineering, furnishing, installing, construction and the removal and disposal of all such temporary erosion and dust control BMP’s as a lump sum item, complete, as required under the provisions of any permits, and in accordance with the requirements of California Construction General Permit No. CAS000002 (State Water Resources Control Board (SWRCB) Orders No. 2009-009-DWQ as amended by Order 2010-0014-DWQ and No. 2012-0006-DWQ of the Construction General Permit.

2. Payment to be made under this bid item shall be for erosion and pollution control compliance, including preparation of the erosion control plan, and any mitigation required, complete in place, and will be made at the lump sum price named in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.

3. Payment of 20% of the Bid Item price shall be made upon submittal, approval and deployment of the erosion control plan BMP’s. Payment of 70% of the Bid Item price shall be made in equal installments for implementation of the erosion control plan. Payment of the final 10% of the Bid Item price shall be paid upon satisfactory removal of the erosion control items when final stabilization has been achieved.

C. UTILITY POTHOLING (Bid Item No. 36)

1. Work under this Bid Item includes marking and pitholing existing belowground utilities that may interfere with new construction and cross new pipelines or electrical conduits, submitting detailed pothole reports, revising shop drawings of affected new pipelines and conduits, and coordinating with Dig Alert, utility companies, and owners of underground facilities. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.
D. CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT (Bid Item No. 37)

1. Work under this Bid Item includes preparing, submitting, and implementing construction and demolition (C&D) waste management plan, recycling and disposal of non-hazardous demolition and construction waste, submitting C&D recycling reports, submitting recycling and processing facility records, and submitting landfill and incinerator disposal records involved in construction of all Schedule D items. All work shall be complete and in accordance with the Contract Documents, including Specification Section 01 74 19.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

E. SHEETING, SHORTHING, AND BRACING OR EQUIVALENT METHOD (Bid Item No. 38)

1. Measurement for payment for temporary sheeting, shoring, and bracing or equivalent method will be based upon the completion of all planning, design, engineering, furnishing, and construction and the removal and disposal of all such temporary sheeting, shoring, and bracing for construction of La Granada pump station, standby Generator, and associated components, as required under the provisions of any permits, and in accordance with the requirements of OSHA and the Construction Safety Orders of the State of California, pursuant to the provisions of Section 6707 of the California Labor Code. All work shall be complete and in accordance with the Contract Documents, including Specification Section 02 40 00.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

F. LA GRANADA PUMP STATION AND STANDBY GENERATOR FACILITIES (Bid Item No. 39)

1. Work under this Bid Item includes all work within La Granada Reservoir Properties, excepting work covered under other bid items.

   a. The work includes, but not limited to, the following major components.

      1) Removal of existing components interfering with new construction and replacing with new.
2) Clearing and grubbing.
3) Demolition and removal of existing components, including chain link fence and gate, interfering trees, irrigation system and pump, radio antenna, antenna pole, guard posts, piping, etc.
4) Two 750 gpm, 50HP pumps and motors.
5) One 4,000 gpm, 300HP fire pump and motor.
6) 4 inches through 24 inches welded steel yard piping and appurtenances, including pipes pump suction sides and discharge side.
7) Connection to existing reservoir inlet-outlet piping.
8) Isolation butterfly, gate, and ball valves of different sizes, ½” though 24”.
9) Pump control valves.
10) 16” flow meter.
11) Pipe expansion joints.
12) Small diameter copper piping and valves.
13) Exhaust fans.
14) Trolley beam and trolley.
15) Surge protection system involving surge tank, air compressor, and associated controls.
16) 480VAC Electrical switchboard, ATS, and MCC
17) 240/120 VAC panel board
18) 480 VAC power system.
19) 480V-240/120V transformer
20) 240/120 VAC power system.
21) Building interior and exterior lighting.
22) Exterior area lighting.
23) Control cabinet and SCADA system with PLC, relays, UPS, and associated components.
24) Electrical, instrumentation, and communication conduits and wires.
25) Instruments, including pressure gages, pressure transmitter, pressure switches, level transmitter, level electrodes, limit switches, and intrusion switches.
26) Existing reservoir seismic valve power and control system relocation and integration new power and control systems.
27) Existing reservoir water level transmitter and cathodic protection system integration with new power and control systems.
28) Integration with fiber optic communication system.
29) Building to house new pumps, piping, and electrical equipment. Building includes concrete foundations for walls, concrete floor slabs, masonry walls, wood framed roof system, roofing system, roof gutters and downspouts, steel beams, skylights, louvers, doors, glass block walls, glass windows, etc.
30) Concrete pad around building and for equipment.
31) Building floor drains and associated drain box and sump pump.
32) Irrigation piping and controllers, backflow preventer, and irrigation meter.
33) 400 kW diesel operated standby emergency generator system involving engine, generator, exhaust system, sound attenuated enclosure, fuel storage tank and piping, generator controls, electrical and instrumentation conduits and wires, concrete foundation, and obtaining permits, etc.
34) Site improvements, including new masonry retaining wall, chain link fence and gate, painting, and coting.
35) Coordination with utility companies, City staff, City’s SCADA consultant, standby generator permitting agency, and other regulating agencies as required.

b. The work includes, earthwork, excavation, fill, backfill, concrete work, masonry work, mechanical work, metal work, structural steel work, and electrical and, instrumentation, and control works.

c. All work shall be complete and in accordance with the Contract Documents, as required by utility companies, and as per requirements of applicable permits, and regulating agencies.

d. Placement of new aggregate base, asphalt pavement, concrete curbs gutters, and ditches and associated work shall not be part of this Bid Schedule. These items are covered under a separate Bid Schedule.

3. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

G. ROCK EXCAVATION AND REMOVAL (Bid Item No. 40)

1. Work under this Bid Item includes excavation and removal of rock if encountered during construction of La Granada Pump Station and Standby Generator facilities. The work includes, but not limited to, excavating, removing, and disposing rocks encountered in trenches and excavated areas, submitting tickets showing net weight of removed rock, and performing other pertinent tasks, as required. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made if rock is encountered, excavated, and removed. Payment for this Bid Item will be made at the unit price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.
H. WORK CLOSEOUT – BID SCHEDULE D (Bid Item No. 41)

1. Work under this Bid Item includes closeout work for La Granada Pump Station and Standby Generator. The work includes, but not limited to, site cleanup, removal of temporary facilities, completion of punch list items, submitting completed site photos and videos, operation and maintenance manuals, warranties, test reports, as-built drawings, and performing other pertinent and applicable tasks specified in Section 01 77 00. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.

2.05 BID SCHEDULE E - RESERVOIR ACCESS AND PERIMETER ROADS IMPROVEMENTS

A. REMOVAL AND DISPOSAL OF EXISTING MATERIALS (Bid Item No. 42)

1. Work under this Bid Item includes removal and disposal of existing materials as specified and as required to perform new road improvements. The work includes removal and disposal of existing asphalt pavement, aggregate base, sub-base soil material, asphalt curbs, and concrete curbs, gutters, ditches, and cross gutters from reservoir access and perimeter road areas. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

B. CONSTRUCTION AND DEMOILITION WASTE MANAGEMENT (Bid Item No. 43)

1. Work under this Bid Item includes preparing, submitting, and implementing construction and demolition (C&D) waste management plan, recycling and disposal of non-hazardous demolition and construction waste, submitting C&D recycling reports, submitting recycling and processing facility records, and submitting landfill and incinerator disposal records involved in construction of all Schedule E items. All work shall be complete and in accordance with the Contract Documents, including Specification Section 01 74 19.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of
all such work as required herein. Payment will be made based on the percentage of work completed each month.

C. FILL AND AGGREGATE BASE INSTALLATION AND GRADING (Bid Item No. 44)

1. Work under this Bid Item includes scarification and compaction of sub-base, placement of fill material as required, installation of aggregate base, and performing required grading along reservoir access and perimeter road areas. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

D. NEW CONCRETE CURBS, GUTTERS, V-DITCHES, AND CROSS GUTTERS (Bid Item No. 45)

1. Work under this Bid Item includes installation of new concrete curbs, gutters, v-ditches, and cross gutters along reservoir access and perimeter road areas. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

E. NEW ASPHALT CONCRETE (Bid Item No. 46)

1. Work under this Bid Item includes installation of new asphalt concrete pavement along reservoir access and perimeter road areas. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

F. NEW CONCRETE PAVEMENT (Bid Item No. 47)

3. Work under this Bid Item includes installation of new concrete pavement along reservoir access from Mountain Crest Circle cul-de-sac to 5’ behind the existing pipe gate. The work shall include placement of reinforcement, and concrete, concrete joints, concrete finishing and all other associated
components. All work shall be complete and in accordance with the Contract Documents.

4. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein. Payment will be made based on the percentage of work completed each month.

G. WORK CLOSEOUT – BID SCHEDULE E (Bid Item No. 48)

1. Work under this Bid Item includes closeout work for Schedule E items. The work includes, but not limited to, site cleanup, removal of temporary facilities, completion of punch list items, submitting completed site photos and videos, operation and maintenance manuals, warranties, test reports, as-built drawings, and performing other pertinent and applicable tasks specified in Section 01 77 00. All work shall be complete and in accordance with the Contract Documents.

2. Payment for this Bid Item will be made at the price bid therefor in the Bid Schedule, which price shall constitute full compensation for completion of all such work as required herein.

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SECTION 01 31 13
COORDINATION

1.01 GENERAL

The Contractor shall be responsible for all Project coordination and the coordination of the work of all subcontractors, fabricators, utility agencies, inspectors and suppliers. Coordination, as referred to herein, shall include the establishment of on-site lines of authority and communication and the scheduling of and conducting of progress meetings between the Engineer and the Contractor and its subcontractors, fabricators, utility agencies, inspectors and suppliers. The Contractor’s onsite supervisory person shall be present and shall represent the General Contractor whenever a meeting is held that involves any interface between the Engineer or the City and any subcontractors, fabricators, or suppliers.

1.02 ARRANGEMENTS FOR TEMPORARY CONSTRUCTION FACILITIES

The Contractor shall be responsible for the allocation of space for temporary structures furnished by its subcontractors; monitoring the use of temporary utilities; verification that adequate services are provided to comply with requirements for Work and climatic conditions; and the administration of traffic and parking controls. All such work shall be in strict conformance with all applicable requirements of the Contract Documents.

1.03 COST CONTROL

A. The Contractor shall review and refine the approved estimate of construction cost and shall monitor and record actual costs and estimates for uncompleted Work, including that of all subcontractors, fabricators, and suppliers. All approved changes shall be incorporated as they occur.

B. In addition, the Contractor shall be responsible for the following:

1. Maintain cost accounting records for authorized Work performed under unit costs, actual costs for labor and materials, and other basis requiring accounting records.

2. Develop and implement procedure for review and processing of applications for progress and final payments: Submit recommendations to the Engineer for certification to the City for Payment.
1.04 GENERAL COORDINATION

A. All Work covered in the Contract Documents shall be coordinated as a part of the Contractor's obligations under the Contract.

B. The Contractor shall assure timely fabrication of work, erection of work, and completion of closeout items and the timely preparation of shop drawings and other submittals in conformance with the approved construction schedule.

C. The Contractor shall coordinate the efforts of all individuals and subcontractors in the execution of the Work.

D. City shall not be responsible for any lost/waiting time costs or schedule impacts resulting from lack of timely coordination by Contractor.

E. Unless otherwise directed by the Engineer, in writing, the final asphalt repair and overlay shall be completed after all work requiring heavy equipment has been completed. Any damage done to the roadway during construction as a result of the Contractor's construction activities or due to inadequate structural section shall be repaired by the Contractor at no additional cost to the City.

F. The Contractor shall coordinate with utility companies as required in a timely manner to complete the work.

1.05 SPECIAL COORDINATION

A. Drawings showing the location of equipment, piping, ducts, etc., are diagrammatic only. Even though every effort has been made to provide adequate routing and placement, job conditions will not always permit their locations in the field where indicated on the drawings. Whenever this condition is encountered by the Contractor, he or she shall notify the Engineer immediately to obtain the Engineer's determination of any necessary relocation. Minor adjustments in locations, or rerouting due to ill-timed or improper sequence of trades shall be the responsibility of the Contractor and shall be performed at no additional cost to the City.

B. The Contractor shall provide advance notification to the Engineer of specific tasks and inspections specified. Failure to provide such advance notification may be cause for rejection of the Work.

C. Wherever prefabricated items are to be incorporated into the Work, the Contractor shall use templates and shall set fasteners accurately to the templates.

D. Contractor shall coordinate with the existing property owners and tenants for those properties where the Contract Documents show work to be performed on
private property. The City will secure the permanent utility easements required for said locations, however it is the Contractor’s responsibility to coordinate for onsite access and scheduling to minimize impact with said properties.

E. All dimensions shall be verified to assure that all components will fit together properly. Particular care shall be exercised to assure workability, access, symmetry, and alignment of components. Whenever the Contractor is in doubt of the intended effect of the Contract Documents, a request for information or clarification shall be tendered in writing to the Engineer prior to layout of building elements.

1.06 COORDINATION OF SUBCONTRACTOR RESPONSIBILITIES

A. The Contractor shall be responsible for coordination of the work of each of its subcontractors and suppliers. Special attention is directed to the following obligations of the Contractor:

1. Verify that subcontractors have obtained permits for inspections.

2. Review all subcontractor shop drawings, product data, and sample submittals for compliance with Contract Documents prior to submittal to the Engineer for general review for compliance with design intent.

3. Maintain onsite documentation and keep current record drawing set at Project site.

4. Verify that specified cleaning is done during progress of Work and at completion of each subcontract.

1.07 CLEARANCES FOR EQUIPMENT AND SYSTEMS

A. Adequate clearance shall be provided by the Contractor between architectural, structural, plumbing, fire sprinkler, HVAC, electrical, and other utility systems.

B. Drawings shall be reviewed by the Contractor for possible conflicts prior to roughing in. All access routes through concealed spaces shall be checked.

C. The Contractor shall be responsible for verification that equipment and systems will fit in the spaces provided. All conflicts shall be resolved in cooperation with the Engineer prior to rough-in.

D. Work already installed that requires re-routing or modification due to conflicts with other work shall be corrected at the Contractor's expense. Piping ducts and conduits shall be held as possible to the structure above to provide for designed ceiling heights and clearances.
1.08 COORDINATION WITH SOUTHERN CALIFORNIA EDISON (SCE)

A. The Contractor shall notify the City and Southern California Edison (SCE) in writing at least 40 Calendar Days in advance of requiring the services of SCE.

B. For any submittals, including subsequent resubmittals if necessary, that must be reviewed and approved by SCE, the Contractor shall allow up to 4 additional weeks submittal review time.

C. All work that could affect the SCE system shall be approved in writing by SCE. The Contractor shall coordinate with SCE for obtaining such approval from SCE.

D. The Contractor shall coordinate with SCE for scheduling inspection by SCE representatives of all work that would affect SCE system and as required by SCE. This may include, but is not limited to, the following:

   1. Installation of SCE conduits, pull boxes, transformer facility, wires, equipment, meter, etc.
   2. Removal or modifications of existing power supply pedestal, meter, conduit, and wires.

E. The Contractor shall coordinate with SCE for energizing and de-energizing the SCE power system (permanent and temporary) as required.

F. No Extra Work will be granted to the Contractor for failure to properly notify SCE in a timely manner.

1.09 COORDINATION WITH FRONTIER

A. The Contractor shall notify the City and Frontier (communication service provider) in writing at least 40 Calendar Days in advance of requiring the services of Frontier.

B. For any submittals, including subsequent resubmittals if necessary, that must be reviewed and approved by Frontier, the Contractor shall allow up to 4 additional weeks submittal review time.

C. All work that could affect the Frontier system shall be approved in writing by Frontier. The Contractor shall coordinate with Frontier for obtaining such approval from Frontier.
D. The Contractor shall coordinate with Frontier for scheduling inspection by Frontier representatives of all work that would affect Frontier system and as required by Frontier. This may include, but is not limited to, the following:

1. Installation of Frontier conduits, pull boxes, wires, optic fiber cables, cabinet, patch panels, etc.

2. Removal or modifications of existing conduit and wires.

E. The Contractor shall coordinate with Frontier for startup of communication system as required.

F. No Extra Work will be granted to the Contractor for failure to properly notify Frontier in a timely manner.

1.10 COORDINATION FOR FIELD OBSERVATION

A. Contractor’s work in field will be observed full time or part time as determined by the City.

B. The Contractor shall coordinate with the City’s staff and City’s Representatives during the entire course of the project for field observation of work to be performed by him or his subcontractors.

END OF SECTION
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1.01 GENERAL

A. The Contractor, along with the Contractor's Superintendent or on-site Project Manager and its safety representative, as a minimum, shall attend all meetings scheduled by the Engineer for coordination and collection and dissemination of information related to the Work.

B. The Contractor shall notify the Engineer of all proposed safety meetings.

1.02 PROJECT MEETINGS

A. Preconstruction Conference: Prior to the commencement of Work at the site, a preconstruction conference will be held at a mutually agreed upon time and place which shall be attended by the Contractor, its superintendent, and its subcontractors as appropriate. Other attendees will be:

1. Engineer and the City’s Project Representative / Inspector.
2. Representatives of the City.
3. Governmental representatives, as appropriate.
4. Utility Agencies, as required.
5. Others as requested by Contractor, City, or Engineer.

B. Unless previously submitted to the Engineer, the Contractor shall bring to the conference one copy each of the following:

1. Tentative Construction Schedule.
2. Procurement schedule of major equipment and materials and items requiring long lead time.
3. Shop Drawing/Sample/Substitute or "Or Equal" submittal schedule.
4. Schedule of values (lump sum price breakdown) for progress payment purposes.

C. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The complete
agenda will be furnished to the Contractor prior to the meeting date, which may include the following:

1. Contractor's tentative schedules.
2. Transmittal, review, and distribution of Contractor's submittals.
3. Processing applications for payment.
5. Critical work sequencing.
6. Field decisions and Change Orders.
7. Use of project site, office and storage areas, security, housekeeping, and City's needs.
8. Major equipment deliveries and priorities.
9. Contractor's assignments for safety and first aid.

D. The Engineer will preside at the preconstruction conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.

E. **Progress Meetings:** The Contractor shall attend and participate in regular on-site progress meetings at least weekly and at other times or frequencies as determined by Engineer. The Contractor, Engineer, and all subcontractors active and soon to be active on the site shall be represented at each meeting. Contractor may, at its discretion, request attendance by representatives of its suppliers, manufacturers, and other subcontractors. The purpose of the meetings will be to review the progress of the Work maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.

F. Contractor is required to submit the 3-week lookahead schedule no later than 24 hours prior to the weekly progress meeting. The 3-week lookahead schedule shall at a minimum show actual performance for the previous week, as well as planned work for the current week and planned work for the two successive weeks following the current week.

END OF SECTION
SECTION 01 32 13

CPM CONSTRUCTION SCHEDULE

1.01 GENERAL

A. The project management scheduling tool "Critical Path Method," a network scheduling system commonly called CPM, shall be employed by the Contractor for planning, and scheduling, of all work required under the Contract Documents. All schedule reports shall be in the form of electronic PDF and in native electronic format. The Contractor may elect to use bar charts (Gantt Charts) as an onsite scheduling tool; provided that all such bar charts shall be generated from the approved CPM network using the same computer program as used for the CPM network and reports submitted to the Engineer.

B. The schedule shall clearly identify all staffing and other resources which in the Contractor’s judgment are needed to complete the Work within the Contract Time. The schedule shall clearly state the number of staff to be used on each daily segment of the Work. Schedule duration shall match the Contract Time.

C. Contractor’s schedule shall be based upon the inclusion of the required number of days of inclement weather and/or rain days to be included, within the specified overall duration of the project as stipulated in the Summary of Work 01 11 00, as well as accommodate all holidays that fall within the base contract duration.

D. Contractor’s Schedule shall incorporate sufficient time at the end for final closeout and completion of punchlist, as part of the base duration within the specified overall duration of the project.

E. Summary of types and schedule submittals required:

1. **Preliminary Construction Schedule**: Submit within 10 days after date of Notice of Award, a detailed breakdown of Proposed Construction Schedule for review;

2. **Initial Construction Schedule**: Submit within 14 days of date of Notice to Proceed (See Submittals Section for more details) a Revised version of the Preliminary Schedule, incorporating all of the Engineer’s comments. Upon Engineer approval, this will become the Initial “Baseline” Construction Schedule for the project until a revised schedule is required to be submitted; and,

3. **Revised Construction Schedules**: Updated revisions of the Initial Construction Schedules as required by the Engineer shall be submitted with each progress payment.
1.02 QUALIFICATIONS

The Contractor shall ensure that their organization has in-house capability qualified to prepare and use the CPM scheduling technique, or the Contractor will employ a CPM consultant who is so qualified.

1.03 SUBMITTAL PROCEDURES

A. Time of submittals: Within 10 days after the Notice of Award, the Contractor shall submit for acceptance by the Engineer a Preliminary Construction Schedule, a detailed schedule which shall consist of a network diagram and CPM Schedule describing the work activities and procurement to be accomplished in the project, their dependency relationships and schedule reports (as defined following). The schedule produced shall indicate a project completion date on or before the contract completion date. The Engineer shall meet with the Contractor to review the proposed plan and schedule within 14 days after receipt of the Preliminary Construction Schedule.

B. Within 14 days after the conclusion of the Engineer's review of the Preliminary Construction Schedule, the Contractor shall revise the network diagram as required and re-submit the network diagram and the schedule reports produced therefrom. The revised network diagram and schedule reports shall be revised and approved or rejected by the Engineer within 14 days after receipt. The network diagram and schedule reports, when accepted by the Engineer, shall constitute the Initial Construction Schedule until a Revised Construction Schedule is required to be submitted.

C. Acceptance: When the Initial Construction Schedule network diagram and schedule reports have been accepted by the Engineer, the Contractor shall submit to the Engineer the time-scaled network diagram in native electronic Microsoft Project 2010 or later format, as well as PDF, with the activities sorted by Early Starting Date and showing free float and total float.

D. Additional Network Diagrams: If requested by the Engineer, Contractor shall provide revised network diagrams if, at any time, the Engineer considers the completion date to be in jeopardy because of "activities behind schedule." The Additional Network Diagrams shall include a new arrow or precedence diagram and schedule reports conforming to the requirements of Paragraph entitled "CPM Standards," herein, designed to show how the Contractor intends to accomplish the Work to meet the completion date. The form and method employed by the Contractor shall be the same as that required for the original Initial Construction Schedule.

E. Schedule Revisions: The Contractor shall modify any portions of the construction schedule that become unfeasible because of "activities or
procurement behind schedule” or for any other valid reason. An activity that cannot be completed by its original latest completion date shall be deemed to be behind schedule.

1.04 CHANGE ORDERS

Upon issuance of a Change Order or Work Directive Change, the approved change shall be reflected in the next submittal of the Revised Construction Schedule by the Contractor.

1.05 CPM STANDARDS

A. Definition: CPM scheduling, as required by this Section, shall be interpreted to be generally as outlined in the Associated General Contractors publication, "The Use of CPM in Construction," except that either arrow diagramming or activity-on-node precedence diagramming format is acceptable.

B. Construction Schedules: Construction schedules shall include a computer-generated graphic network and computerized, construction schedule reports, as described below.

C. Networks: The CPM scheduling network shall be in the form of a time-scaled arrow or precedence diagram, shall be of the customary activity-on-arrow or activity-on-node type, and may be divided into a number of separate pages with suitable notation relating the interface points among the pages. Notation on each activity arrow shall include a brief work description and a duration estimate (see below). Precedence diagrams in box-node format are not acceptable.

D. All construction activities and procurement shall be indicated in a time-scaled format and a calendar scale shall be shown on all sheets along the entire sheet length. Each activity arrow or node shall be plotted so that the beginning and completion dates and free float time of said activity can be determined graphically by comparison with the calendar scale.

All activities shall be shown using the symbols that clearly distinguish between critical path activities, non-critical activities, and free float for each non-critical activity. All non-critical path activities shall show estimated performances time and free float time in scaled form.

E. Duration Estimates: The duration estimate indicated for each activity shall be computed in working days, converted to calendar days, and shown on the construction schedule in calendar days, and shall represent the single best estimate considering the scope of the Work and resources planned for the activity. Except for certain non-labor activities, such as curing concrete, paint drying, procurement, or delivering of materials, activity durations shall not
exceed 10 working days (14 calendar days) or be shown in increments of less than 1 working day, unless otherwise accepted by the Engineer.

F. The requirement for activity durations not in excess of 10 days shall apply to all schedule submittals except the Proposed Construction Schedule required to be submitted prior to the Notice to Proceed.

G. Schedule Reports: Schedule Reports shall be prepared from the Initial Construction Schedule and from all subsequent Revised Construction Schedules, and shall include the following minimum data for each activity:

1. Activity Numbers or i-j Numbers.
2. Estimated Activity Duration.
3. Activity Description (including procurement items).
4. Early Start Date (Calendar Dated).
5. Early Finish Date (Calendar Dated).
6. Late Start Date (Calendar Dated).
7. Late Finish Date (Calendar Dated).
9. Total Float for Each Activity.
10. Free Float for Each Activity.

H. Digital Format: The Contractor shall provide a copy of the Schedule Reports, sorted by activity number, including not less than Item Nos. 1 through 10, inclusive, of Paragraph F, above, on PDF as well as Native MS Project 2013 or later File Format.

I. Project Information: Each Schedule Report shall be prefaced with the following summary data:

1. Project Name.
2. Contractor Name.
3. Type of Tabulation (Initial or Revised; if revised, show a revision number or date).
4. Project Duration.
5. Project Scheduled Completion Date.
6. The date of commencement of Work as stated in the Notice to Proceed.
7. If an updated (revised) schedule, cite the new project completion date and current project status.

1.06 SCHEDULE REQUIREMENTS

The Contractor shall ensure that the following items are included and accommodated in the Initial Schedule, and subsequent schedule updates. The Initial Schedule shall not be approved as the Baseline Schedule until all items listed below as satisfactorily included in the schedule.
A. Ensure the submitted schedule incorporates all requirements of the specifications.

B. Ensures all the contract milestones, access restraints, shutdowns, permit dates and contract completion dates are consistent with the contract requirements.

C. Verify that the scope of work is completely reflected (all bid items are shown/included).

D. Verify activity durations are reasonable. Any activities longer than 14 calendar days in duration should be broken down into more detail, by location, etc.

E. Verify the overall sequencing, logic and approach makes sense. Physical constraints (i.e. foundations after excavation) and crew-based constraints need to be considered.

F. Include the required number of inclement weather days. These should be shown at the end of the schedule as a single task on the critical path, before the completion date.

G. Include procurement & submittal activities.

H. Properly account for times of reduced productivity (i.e. holidays, CTO Alternate Fridays off).

I. Clearly define the critical path and ensure that it makes sense.

J. Verify that all activities are linked, and that there are no missing predecessors/successors. Forced end dates or activities without successors will not be allowed.

K. Verify activity durations are not inflated/excessively long.

L. Show sufficient detail to monitor complex/long duration items.

M. Include sufficient time for submittals, review, and procurement of the materials listed. Include adequate time for delivery of City-supplied materials and equipment or tie-ins.

N. Include listed activities for events performed by others, such as utilities or permit reviews.

O. Include sufficient time for punch list, cleanup, start-up, testing, final inspection and closeout as defined under specification 01 77 00 Project Closeout at the end of the schedule. Include them within the base duration.
P. Include adequate and reasonable resource loading with reasonable productivity.

Q. Verify the resource loading is reasonable, and that crew sizes and resources are adequate to complete the project, with reasonable productivity.

1.07 CONSTRUCTION SCHEDULE MONITORING

A. At not fewer than monthly intervals, and when specifically requested by the Engineer, the Contractor shall submit to the Engineer a computer printout of a Revised Schedule Report for those activities that remain to be completed. At a minimum, revised Construction Schedules shall be submitted with each progress payment. Progress payments may be withheld if Contractor fails to provide schedule updates as noted above.

B. Each Revised Construction Schedule, including an updated network diagram, if required, shall be submitted in the form, sequence, and in the number of copies requested for the Initial Construction Schedule.

C. A final As-Built Schedule recording the completion of work activities shall be provided by the Contractor upon completion of Contract work along with the final billing. Final billing may be withheld if Contractor fails to provide the As-Built Schedule as noted above.

1.08 COST VALUE FOR ACTIVITIES

A. The Contractor shall establish a cost value for each activity in its CPM network so that monthly partial payments to the Contractor can be calculated on the basis of CPM-reported work in place. All cost value items shall be correlated with the line items of the required Schedule of Values.

B. Subject to the provisions of Article 41 of the General Conditions, all cost value reports for network activities shall be based upon the close of books as of the last day of the each month, and the computer printout report of such cost value for activities shall be submitted to the Engineer for review and approval not later than the 10th day of the following month.

C. Where it is elsewhere provided in these Specifications that payments will be allowed for materials delivered to the site but not yet incorporated in the Work, separate pay items shall be established for such materials and for the furnishing and the installation of such items. Costs of such materials delivered to the site, but not yet incorporated into the Work, shall not be included in the cost value of the installation of such materials but shall be covered under a separate cost value report.

END OF SECTION
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CONTRACTOR SUBMITTALS

1.01 GENERAL

A. General: Wherever submittals are required hereunder, all such submittals by the Contractor shall be submitted to the Engineer through the Project Engineer. A Submittal is defined as any drawing, calculation, specification, product data, samples, manuals, requests for substitutes, spare parts, photographs, survey data, record drawings, bonds, or similar items required to be submitted to the City or the Engineer under the terms of the contract.

B. Submittals Required Immediately After Notice of Award: The Contractor shall submit the following items to the Engineer for review immediately after the Notice of Award:

Required submittals within 10 days after Notice of Award:


Required submittals within 21 days after Notice of Award:

1. A detailed list of Submittals and Shop Drawings.


C. Submittals Required Immediately After Notice to Proceed: Within ten days after the date of commencement as stated in the Notice to Proceed, the Contractor shall submit the following items to the Engineer for review:

1. A list of all permits and licenses the Contractor needs to obtain indicating the agency that will grant the permit, the expected date of submittal for the permit, and required date for receipt of the permit.

2. A preliminary schedule of values (lump sum price breakdown) for all of the Work, which will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices shall include an appropriate amount of overhead and profit applicable to each item of work, which will be confirmed in writing by the Contractor at the time of submittal.
D. **Submittals of Substitutes Required Prior to Award:** As provided under Section 3400 of the California Public Contracts Code, the Contractor shall, within 15 days prior to award of the contract, submit to the Engineer all proposed Substitutes or "Or Equal" products for the Engineer's review and approval. All such submittals shall be in conformance with the requirements of Paragraph 1.04 herein.

E. The Contractor hereby agrees that failure to submit alternative product requests within the stipulated time period shall act as a waiver of any future rights to offer such substitutes, and the Contractor hereby agrees to provide one of the specific products called for in the Contract Documents.

**1.02 SHOP DRAWINGS**

A. Wherever called for in the Contract Documents or where required by the Engineer, the Contractor shall furnish to the Engineer for review, one digital copy of each shop drawing submittal in searchable electronic PDF format, for all submittals unless they consist of physical samples. The term "Shop Drawings" as used herein shall be understood to include detail design calculations, shop drawings, fabrication and installation drawings, erection drawings, lists, graphs, operating instruction, catalog sheets, data sheets, and similar items. Unless otherwise required, said Shop Drawings shall be submitted to the Engineer, at a time sufficiently early to allow review of same by the Engineer and to accommodate the rate of construction progress required under the Contract.

B. All Shop Drawings shall be accompanied by the Engineer's standard submittal transmittal form. This form may be obtained in digital format from the Engineer. Any submittal not accompanied by such a form or where all applicable items on the form are not completed will be returned for resubmittal.

C. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole.

D. Except as may otherwise be provided herein, the Engineer will return digital file of each submittal to the Contractor, with its comments noted thereon, within 21 calendar days following their receipt by the Engineer. It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the Engineer by the second submission of a submittal item. The City reserves the right to withhold monies due the Contractor to cover additional cost of the Engineer's review beyond the second submittal.
E. If the submittal is returned to the Contractor marked "APPROVED" or "ACCEPTED" or "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED – NO RESUBMITTAL REQUIRED," formal revision and resubmission of said submittal will not be required.

F. If the submittal is returned to the Contractor marked "AMEND-RESUBMIT" or "MAKE CORRECTIONS NOTED AND RESUBMIT," the Contractor shall revise said submittal and shall resubmit the revised submittal to the Engineer for review.

G. If the submittal is returned to the Contractor marked "REJECTED-RESUBMIT," the Contractor shall revise and shall resubmit said revised submittal to the Engineer.

H. Fabrication of an item may be commenced only after the Engineer has reviewed the pertinent submittals and returned copies to the Contractor marked either "NO EXCEPTIONS TAKEN" or "APPROVED" or "ACCEPTED" or "MAKE CORRECTIONS NOTED – NO RESUBMITTAL REQUIRED." Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis of claims for extra work.

I. All Contractor submittals shall be carefully reviewed by an authorized representative of the Contractor, prior to submittal to the Engineer. Each submittal shall be dated, signed, and certified by the Contractor, as being correct and in strict conformance with the Contract Documents. In the case of shop drawings, each sheet shall be so dated, signed, and certified. No consideration for review by the Engineer of any Contractor submittals will be made for any items that have not been so certified by the Contractor. All non-certified submittals will be returned to the Contractor without action taken by the Engineer, and any delays caused thereby shall be the total responsibility of the Contractor.

The Contractor shall not deviate in any way from the design, details, or dimensions shown on accepted Shop Drawings or data without the written consent of the Engineer. The City will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

J. The Engineer’s review of Shop Drawings, data, and samples will be for general conformance with the design concept and Contract Documents. The Contractor shall assume all responsibility and risk for any misfits due to any errors in Contractor submittals. The Contractor shall be responsible for details and accuracy, for coordinating the Work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner. The Engineer's review of Contractor submittals shall not be construed:
1. as relieving the Contractor of the entire responsibility for providing correct details, dimensions, quantities, materials, and procedures.

2. as relieving the Contractor of the entire responsibility for his errors and omissions.

3. as permitting the Contractor any departure from the Contract requirements.

K. Hard Copies of Accepted Shop Drawings: The Contractor shall deliver minimum four hard copies in color of all accepted shop drawings, two hard copies to the City and two to the City’s representative, such as, Design Engineer (Perliter & Ingalsbe).

1.03 CONTRACTOR’S SCHEDULES

A. Contractor’s construction schedules shall be prepared and submitted to the Engineer in accordance with the provisions of Section entitled “CPM Construction Schedules” and Section entitled “Mobilization.”

B. Acceptance: When the Initial Construction Schedule has been accepted, the Contractor shall submit to the Engineer 6 copies of the accepted schedule and one digital copy in PDF.

C. Additional Revised Construction Schedules: The Contractor, if requested by the Engineer, shall provide a Revised Construction Schedule if, at any time, the Engineer considers the completion date to be in jeopardy because of any portion of the work falling behind schedule. The Revised Construction Schedule shall show how the Contractor intends to accomplish the Work to meet the completion date. The form and method employed by the Contractor shall be the same as required for the Initial Construction Schedule.

D. Construction Schedule Revisions: The Contractor shall modify any portions of the construction schedule that becomes unfeasible because of portions of the Work falling behind schedule, or for any other valid reason. Any portion of the work that cannot be completed by its originally scheduled completion date shall be deemed to be behind schedule.

1.04 PROPOSED SUBSTITUTES OR "OR EQUAL" ITEMS

A. For convenience in designation in the Contract Documents, any material, product, or equipment to be incorporated in the Work may be designated under a brand or trade name or the name of a manufacturer and its catalog information. The use of any substitute material, product, or equipment which is equal in quality and utility and possesses the required characteristics for the purpose intended will be permitted, subject to the following requirements:
1. The burden of proof as to the quality and utility of any such substitute material, product, or equipment shall be upon the Contractor.

2. The Engineer will be the sole judge as to the quality and utility of any such substitute material, product, or equipment and its decision shall be final.

B. Wherever in the Contract Documents the name or the name and address of a manufacturer or supplier is given for a material, product, or equipment, or if any other source of a material, product, or equipment is indicated therefor, such information is given for the convenience of the Contractor only, and no limit, restriction, or direction is indicated or intended thereby, nor is the accuracy or reliability of such information guaranteed. It shall be the responsibility of the Contractor to determine the accurate identity and location of any such manufacturer, supplier, or other source of any material, product, or equipment called for in the Contract Documents.

C. The Contractor may offer any material, product, or equipment that it considers equal to those specified. Unless otherwise provided by law or authorized in writing by the Engineer, the substantiation of any proposed substitute or "or equal" material, product, or equipment must be submitted prior to award of the contract. The Contractor, at its sole expense, shall furnish data concerning items it has offered as substitute or "or equal" to those specified. The Contractor shall provide the data required by the Engineer to determine that the quality, strength, physical, chemical, or other characteristics, including durability, finish, efficiency, dimensions, service, and suitability are such that the substitute or "or equal" item will fulfill its intended function.

D. The Contractor's attention is further directed to the requirement that its failure to submit data substantiating a request for a substitution of an "or equal" item during the time between the opening of bids and the date of award shall be deemed to mean that the Contractor intends to furnish one of the specific brand or trade-named material, product, or equipment specified in the Contract Documents and the Contractor does hereby waive all rights to offer or use substitute materials, products, or equipment in each such case. Wherever a proposed substitute material, product, or equipment has not been submitted within the time specified above, or wherever the submission of a proposed substitute material, product, or equipment fails to meet the requirements of the Specifications and an acceptable resubmittal is not received by the Engineer within said specified time period, the Contractor shall furnish only one of the materials, products, or equipment originally-named in the Contract Documents. Approval by the Engineer of a substitute item proposed by the Contractor shall not relieve Contractor of the responsibility for full compliance with the Contract Documents and for adequacy of the substituted item. The Contractor shall also be responsible for resultant changes and all additional costs which the
substitution requires in its work, the work of its subcontractors and of other contractors and shall effect such changes without cost to City.

1.05 SAMPLES

A. Unless otherwise specified, whenever in the Specifications samples are required, the Contractor shall submit not less than 2 units of each such sample item or material to the Engineer for approval at no additional cost to the City.

B. Samples, as required herein, shall be submitted for approval a minimum of 15 days prior to ordering such material for delivery to the job site, and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delays in the Work.

C. All samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and manufacturer's names for identification and submittal to the Engineer for approval, through the Project Representative. Upon receiving approval of the Engineer, one set of the samples will be stamped and dated by the Engineer and returned to the Contractor through the Project Representative, one set will be retained by the Engineer, and one set of samples shall remain at the job site for reference by the Engineer and the Project Representative until completion of the Work.

D. Unless otherwise specified, all colors and textures of specified items will be selected by the Engineer from the manufacturer's standard colors and standard materials, products, or equipment lines.

1.06 TECHNICAL MANUALS (OPERATION AND MAINTENANCE MANUALS)

A. Technical Manuals:

1. The Contractor shall submit Technical Manuals in searchable PDF format to Engineer for review until it is accepted.

2. Two hard color copies of accepted technical manuals shall be delivered to the City and one to the Engineer. Each set shall consist of one or more volumes, each of which shall be bound in a standard size, three-ring, loose-leaf, vinyl plastic hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 65 mm (2.5 inches). A table of contents shall be provided which indicates all equipment in the technical manuals.

3. One digital file in searchable PDF format of each accepted technical manual shall be submitted to the Engineer.

B. Using the outline provided in the Equipment Maintenance Summary Sheet (a copy of which may be obtained from the Engineer), the Contractor shall include
for each item of mechanical, electrical, and instrumentation equipment in the technical manuals, the following:

1. Complete operating instructions, including location of controls, special tools or other equipment required, related instrumentation, and other equipment needed for operation.

2. Lubrication schedules, including the lubricant SAE grade and type, temperature range of lubricants, and including frequency of required lubrication.

3. Preventive maintenance procedures and schedules.

4. Parts lists, by generic title and identification number, complete with exploded views of each assembly.

5. Disassembly and reassembly instructions.

6. Name and location of nearest supplier and spare parts warehouse.

7. Recommended trouble-shooting and start-up procedures.

8. Reproducible prints of the Record Drawings, including diagrams and schematics, as required under the electrical and instrumentation portions of these specifications.

9. Tabulation of proper settings for all instruments, control valves, switches, and other similar devices.

10. Detailed test procedures to determine performance efficiency of equipment.

11. List of all electrical relay settings, including alarm and contact settings.

12. Copy of factory test reports.

13. Copy of field test reports.

C. All technical manuals shall be submitted to the Engineer not later than the 75 percent construction completion date. All discrepancies found by the Engineer in the technical manuals shall be corrected by the Contractor within 30 days from the date of written notification by the Engineer.

D. Incomplete or unapproved technical manuals (excepting field test reports) at the 75 percent construction point shall constitute sufficient justification to withhold payment for work completed beyond that period in accordance with
Paragraph entitled "Technical Manual Submittals" of Section entitled "Project Closeout."

E. Schedule of Technical Manuals:

1. Submit technical manuals for each of the following and as it may be specified in individual sections of these Specifications.

<table>
<thead>
<tr>
<th>Equipment or System</th>
<th>Section Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation Controller</td>
<td>02 81 00</td>
</tr>
<tr>
<td>Skylights</td>
<td>07 81 30</td>
</tr>
<tr>
<td>Vertical Turbine Pumps</td>
<td>11 21 40</td>
</tr>
<tr>
<td>Air Vacuum and Air Release Valves</td>
<td>11 28 20</td>
</tr>
<tr>
<td>Pump Control Valve</td>
<td>11 28 70</td>
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<tr>
<td>Reduced-Pressure Principle Backflow Preventer</td>
<td>11 28 80</td>
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<tr>
<td>Flow Meter</td>
<td>11 30 00</td>
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<tr>
<td>Air Compressor</td>
<td>15 05 50</td>
</tr>
<tr>
<td>Hydropneumatic Surge Control Tank System</td>
<td>15 20 00</td>
</tr>
<tr>
<td>Exhaust Fans</td>
<td>15 32 00</td>
</tr>
<tr>
<td>Switchgear with MCC, Soft Starters, Power Monitor</td>
<td>16 60 00</td>
</tr>
<tr>
<td>Standby Diesel Engine Power Generator System – 480 VAC</td>
<td>16 70 50</td>
</tr>
<tr>
<td>Automatic Transfer Switch (ATS)</td>
<td>16 80 00</td>
</tr>
<tr>
<td>Control Cabinet, Controls and PLC</td>
<td>16 90 00</td>
</tr>
<tr>
<td>Instruments</td>
<td>17 40 00</td>
</tr>
</tbody>
</table>

1.07 SPARE PARTS LISTS

The Contractor shall furnish to the Engineer 3 identical sets of spare parts information for all mechanical and electrical equipment. The spare parts list shall include the current list price of each spare part. The spare parts list shall be limited to those spare parts that each manufacturer recommends be maintained by the City in inventory at the library site. Each manufacturer or supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts to facilitate the City in ordering. The Contractor shall cross-reference all spare parts lists to the equipment numbers designated in the Contract Documents. The spare parts lists shall be bound in standard size, three-ring, loose-leaf, vinyl plastic hard cover binders suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches. Submit one digital file in searchable PDF format of accepted spare parts list.
1.08 FIELDMarkup DRAWINGS & RECORD DRAWINGS

A. **General:** The Contractor shall keep and maintain, at the job site, one Field Markup set of Contract Drawings. On these Contract Drawings, Contractor shall clearly and neatly mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features, which are revealed during the course of construction. The Contractor shall mark all affected plans, details, and notes, as applicable, for noted changes and deviations.

B. Special attention shall be given to recording the horizontal and vertical locations of all buried utilities that differ from the locations indicated or that were not indicated on the Contract Drawings. Said Record Drawings shall be supplemented by any detailed sketches as necessary or directed to fully indicate the Work as actually constructed.

C. These master Record Drawings of the Contractor's representation of "as-built" conditions, including all revisions made necessary by addenda, change orders, and the like, shall be maintained up-to-date during the progress of the Work.

D. In the case of those drawings which depict the detail requirement for equipment to be assembled and wired in the factory, the record drawings shall be updated by indicating those portions which are superseded by change order drawings or final shop drawings, and by including appropriate reference information describing the change orders by number and the shop drawings by manufacturer, drawing, and revision numbers.

E. Record Drawings prepared by the Contractor shall be accessible to the Engineer at all times during the construction period and shall be delivered to the Engineer upon completion of the work.

F. **Effect on Progress Payments:** Requests for partial payments will not be approved if the Field Markup Drawings are not kept current. All such Record Drawings will be submitted to and reviewed by inspected by the Engineer each month in conjunction with each Progress Billing. They shall clearly depict all variations between the Work as actually constructed and as originally shown on the Contract Drawings or other Contract Documents, and the City will not process monthly payment requests until such drawings are made current each month.

G. **Final Record Drawings:**

1. Upon substantial completion of the Work and prior to final acceptance by the City, the Contractor shall complete and deliver a hard copy of the completed set of Record Drawings to the Engineer for transmittal to the
City, conforming to the construction records of the Contractor. The Contractor shall mark all affected plans, details, and notes, as applicable, for noted changes and deviations. This set of drawings shall consist of corrected plans showing the reported location of the Work. The information submitted by the Contractor and incorporated by the Engineer into the Record Drawings will be assumed to be reliable, and the Engineer will not be responsible for the accuracy of such information, or for any errors or omissions, which may appear on the Record Drawings as a result.

2. The final Record Drawings shall be scanned in color in pdf format and submitted to the Engineer.

H. Effect on Final Payment: Final payment will not be approved until the Contractor-prepared Final Record Drawings have been delivered to the Engineer. Said up-to-date, Record Drawings may be in the form of a set of prints with carefully plotted information overlaid in pencil.

1.09 PHOTOGRAPHS AND VIDEOS

A. Photographs: The Contractor shall provide photographs showing existing condition of the site and work area prior to start of construction and the regular progress of the work.

1. All photographs shall be submitted to the Engineer in digital format compatible with Microsoft Windows operating systems such as .bmp, .gif, .jpeg, .png and .tif.

2. Photographs shall have a minimum resolution of 1024x768 pixels.

3. The Contractor shall capture photographs before commencement of the work showing existing condition of the site(s) and vicinity areas as follows.

   a. 40 photos minimum for La Granada reservoir site and vicinity area where new La Granada pump station and standby diesel generator are to be installed.

   b. 40 photos minimum along 18-inch pump station discharge pipe and SCE conduit routes and area where existing 14-inch reservoir inlet-outlet pipe is to be modified.

   c. 60 photos minimum along 10-inch waterline route in La Granada Drive and vicinity area.

4. Photographs shall be taken of the work in progress consisting of different subjects and angles of view each time.
5. The Contractor shall capture a minimum of 5 photographs minimum per day when field work is performed.

6. After completion of the work, the Contractor shall capture photos of sites and vicinity areas as follows.
   a. 40 photos minimum for La Granada reservoir site, La Granada pump station and standby diesel generator.
   b. 40 photos minimum along 18-inch pump station discharge pipe and SCE conduit routes and area where existing 14-inch reservoir inlet-outlet pipe is modified.
   c. 60 photos minimum along 10-inch waterline route in La Granada Drive.

B. Videos: The Contractor shall provide videos of the project site.
   1. All videos shall be submitted in a digital format compatible with Microsoft Windows operating systems such as .avi, .mov, .mpeg, and .wmv.
   2. Videos shall have a minimum resolution of 800x600 pixels.
   3. The Contractor shall video the entire project site to create a permanent record of existing conditions prior to commencement of the work.
   4. The Contractor shall capture a video of the entire project site after completion of the work.

C. Submittals shall be in a current permanent media format such as compact disk digital versatile disk (DVD) or solid-state drive (flash drive) or external storage drive.

D. All photographs and videos shall be submitted to the Engineer within two weeks after capture.

E. No separate payment will be allowed for construction photographs and videos and all costs therefor shall be included in the overall bid for construction of the work.

1.10 SHEETING, SHORING, BRACING, OR SLOPING OF EXCAVATIONS

Prior to commencement of any excavation, 5 feet or greater in depth, the Contractor shall submit to the City or its Engineer, a detailed plan showing the
design of sheeting, shoring, bracing, sloping, or equivalent method, and shall be in receipt of the City's acceptance of same.

END OF SECTION
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ABBREVIATIONS

1.01 GENERAL

Wherever in these Specifications references are made to the standards, specifications, or other published data of the various national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user, the following acronyms or abbreviations that may appear in these Specifications shall have the meanings indicated herein.

1.02 ABBREVIATIONS AND ACRONYMS

AAMA  Architectural Aluminum Manufacturer’s Association
AASHTO  American Association of State Highway and Transportation Officials
ACI  American Concrete Institute
AI  The Asphalt Institute
AIA  American Institute of Architects
AISC  American Institute of Steel Construction
AISI  American Iron and Steel Institute
ANSI  American National Standards Institute, Inc.
APA  American Plywood Association
APWA  American Public Works Association
ASCE  American Society of Civil Engineers
ASHRAE  American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ASME  American Society of Mechanical Engineers
ASTM  American Society for Testing and Materials
AWPA  American Wood Preservers Association
AWPI  American Wood Preservers Institute
AWS  American Welding Society
AWWA  American Water Works Association
BBC  Basic Building Code, Building Officials and Code Administrators International
BHMA  Builders Hardware Manufacturer’s Association
CBC  California Building Code
CMA  Concrete Masonry Association
CRSI  Concrete Reinforcing Steel Institute
EIA  Electronic Industries Association
ETL  Electrical Test Laboratories
ICBO  International Conference of Building Officials
IEEE  Institute of Electrical and Electronics Engineers
IES  Illuminating Engineering Society
IPC  Institute of Printed Circuits
IPCEA  Insulated Power Cable Engineers Association
ISA  Instrument Society of America
ISO  International Organization for Standardization
ITE  Institute of Traffic Engineers
NEC  National Electrical Code
NEMA National Electrical Manufacturer's Association
NFPA National Fire Protection Association
NFPA National Forest Products Association
OSHA Occupational Safety and Health Administration
PCA Portland Cement Association
SMA Screen Manufacturer's Association
SMACC Sheet Metal and Air Conditioning Contractors National Association
NA The Society for Protective Coatings
SSPC Standard Specifications for Public Works Construction
SSPWC Underwriters Laboratories, Inc.
UL Wire Reinforcement Institute, Inc.
WRI

END OF SECTION
SECTION 01 42 19

REFERENCE STANDARDS

1.01 GENERAL

A. Titles of Sections and Paragraphs: Captions accompanying specification sections and paragraphs are for convenience of reference only, and do not form a part of the Specifications.

B. Applicable Publications: Whenever in these specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the Work is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the drawings shall be waived because of any provision of, or omission from, said standards or requirements.

C. Specialists, Assignments: In certain instances, specifications test requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the Work; also they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the Contractor.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. The latest edition of the following standards shall be incorporated into the Contract Documents by Reference, and callouts the Contract Drawings:

6. References herein to building codes shall mean the most current of the following listed codes, including all addenda, modifications, amendments, or other lawful changes thereto:


   b. California Building Code, as published by the California Building Standard Commission (CBSC)

   c. California Plumbing Code, as published by the California Building Standard Commission (CBSC)

   d. California Mechanical Code, as Published by the California Building Standard Commission (CBSC)

   e. California Fire Code, as Published by the California Building Standard Commission (CBSC)

   f. National Electric Code, as Published by the National Fire Protection Association (NFPA)

   g. International Fire Code, as published by the International Code Council, Inc. (ICC)

   h. California Administrative Code, Title 19 Public Safety, and Title 24 Building Standards

B. Without limiting the general provisions of other portions of the specifications, all work specified herein shall conform to or exceed the requirements of all applicable codes and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of these Specifications nor the applicable codes.

C. In case of conflict between codes, reference standards, drawings and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the City for clarification and directions prior to ordering or providing any materials or labor. The Contractor shall bid the most stringent requirements.

D. Applicable Standard Specifications: The contractor shall construct the Work specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed herein; except, that whenever references to "Standard Specifications" are made, the provisions therein for measurement and payment shall not apply.
E. References in the Contract Documents to "Standard Specifications" shall mean the GREENBOOK Standard Specifications.

F. **Applicable Standard Drawings:** References herein to "Standard Drawings" shall mean the Standard Plans of the GREENBOOK Standard Specifications, which drawings are hereby incorporated in and made a part of these Contract Documents, and copies of which are included in Appendix A herein.

G. **Applicable Safety Standards:** References herein to "Cal-OSHA" shall mean State of California, Department of Industrial Relations, Construction Safety Orders, as amended to Date, and all changes and amendments thereto which are effective as of the date of construction. References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

**END OF SECTION**
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SECTION 01 45 00
QUALITY CONTROL

1.01 SITE INVESTIGATION AND CONTROL

A. The Contractor shall verify all dimensions in the field and shall check all field conditions continuously during construction. The Contractor shall be solely responsible for any inaccuracies built into the Work.

B. The Contractor shall inspect related and appurtenant work and shall report in writing to the Engineer any conditions that will prevent proper completion of the Work. Any required removal, repair, or replacement caused by unsuitable conditions shall be done by the Contractor at its sole cost and expense.

1.02 INSPECTION OF THE WORK

A. General: The Work shall be conducted under the general observation of the Engineer and shall be subject to inspection by representatives of the City to assure strict compliance with the requirements of the Contract Documents.

B. The authorized representative of the Engineer on the project site shall be the Resident Project Representative acting directly and through various inspectors at the site. The presence of the Inspectors, however, shall not relieve the Contractor of the responsibility for the proper execution of the Work in accordance with all requirements of the Contract Documents. Compliance is distinctly a duty of the Contractor, and said duty shall not be avoided by any act or omission on the part of the inspector(s).

C. All materials and articles furnished by the Contractor shall be subject to rigid inspection, and no material or articles shall be used in the Work until it has been inspected and accepted by the Engineer or the City.

D. Inspection at Place of Manufacture: Unless otherwise specified, all products, materials, and equipment shall be subject to inspection by the Engineer at the place of manufacture.

E. The presence of the Engineer at the place of manufacture, however, shall not relieve the Contractor of the responsibility for furnishing products, materials, and equipment that comply with all requirements of the Contract Documents.

1.03 SAMPLING AND TESTING

A. Unless otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM or other specified
published standards, as applicable to the class and nature of the article or materials considered; however, the City reserves the right to use any generally accepted system of sampling and testing which, in the opinion of the Engineer, will assure the City that the quality of the workmanship is in full accord with the Contract Documents.

B. Any waiver by the City of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial Work, shall not be construed as a waiver of any prescriptive or performance requirements of the Contract Documents.

C. Notwithstanding the existence of such waiver, and in addition to any testing and inspection performed by any other inspector on behalf of the City or any other public agency having jurisdiction, the Engineer shall have the right to make independent investigations and tests, and failure of any portion of the Work to meet any of the requirements of the Contract Documents, shall be reasonable cause for the Engineer to require the removal or correction and reconstruction of any such work in accordance with the General Conditions.

1.04 TIME OF INSPECTIONS AND TESTS

A. Samples and test specimens required under the Contract Documents shall be furnished by the Contractor and prepared for testing in ample time for the completion of the necessary tests and analyses before the subject materials or articles are to be used. The Contractor shall furnish all required test specimens that are selected or required by the City or the City's testing laboratory.

B. City will engage a laboratory to perform tests at its discretion for soil compaction, concrete strength, mortar strength, asphalt, and other materials as deemed necessary. Costs for first time testing of materials performed by the City will be borne by the City. If results of any first-time test are unsatisfactory, costs of retesting shall be borne by the Contractor.

C. The Contractor shall perform and pay for all required testing specified in the Contract Documents.

D. Whenever the Contractor is ready to backfill, bury, cast in concrete, hide, or otherwise cover or make inaccessible any work under the Contract, the Contractor shall notify the Engineer not less than 48 hours in advance of beginning any such work of backfilling, burying, casting in concrete, hiding, covering, or making inaccessible any portion of the Work to be inspected, so that the required inspections can be scheduled and performed. Failure of the Contractor to notify the Engineer at least 48 hours in advance of any such inspections shall be reasonable cause for the Engineer to require sufficient
delay in the Contractor's schedule to allow time for such inspections and any remedial or corrective work required, and all costs of such delays, including its impact or effect upon other portions of the Work, shall be borne by the Contractor. The Contractor shall notify the Engineer prior to start of the following work, but not limited to:

1. Installation of 10-inch and larger diameter pipeline and appurtenances.
2. Connections to existing pipelines.
3. Trench and excavation backfilling.
4. Pipeline disinfection and testing.
5. Welding and weld testing.
6. SCE conduit system placement, including backfilling.
7. Electrical and communication conduits installation.
10. Installation of roofing material.
11. Installation of pump cans.
12. Installation of pump and motors.
13. Installation of electrical switchboard, MCC, and control cabinet.
15. Installation of standby generator and appurtenances.
16. Field testing of major components, including pump, motors, electrical equipment, controls, valves, instruments, loops, PLC, and hydrogenerator.
17. Asphalt pavement placement, including aggregate base.
18. Installation of fence, gate, concrete gutter, and curb.
19. Facility start up.
20. Preliminary walk-through.
21. Final walk-through.

END OF SECTION
SECTION 01 51 00
TEMPORARY UTILITIES

1.01 GENERAL

A. In addition to the requirements for utilities specified in Sections entitled “Temporary Power and Control Systems” and “Engineer's Field Office, Equipment and Services,” it shall be the Contractor's responsibility to provide temporary utilities and facilities, including materials, plant and equipment that are adequate for the performance of the Work under this Contract within the time specified. All temporary utilities and facilities shall be kept in satisfactory operating condition, shall be capable of safely and efficiently performing the required Work, and shall be subject to inspection and approval by the City's representative at any time within the duration of the Contract. All work hereunder shall conform to the applicable requirements of Cal-OSHA Construction Safety Orders.

B. All temporary utilities and facilities shall be removed after they are no longer required.

1.02 POWER AND LIGHTING

A. Power: The Contractor shall provide all necessary temporary power required for its operations under the Contract and shall provide and maintain all temporary power lines required to perform the Work in a safe and satisfactory manner.

B. Construction Lighting: All Work conducted at night or under conditions of deficient daylight shall be suitably lighted to ensure proper Work and to afford adequate facilities for inspection and safe working conditions.

C. Approval of Electrical Connections: All temporary connections for electricity shall be subject to approval of the Engineer and the power company representative and shall be removed in like manner at the Contractor's expense prior to final acceptance of the Work by the City.

D. Separation of Circuits: Unless otherwise permitted by the Engineer, circuits separate from lighting circuits shall be used for all power purposes.

E. Construction Wiring: All wiring for temporary electric light and power shall be properly installed and maintained and shall be securely fastened in place. All electrical facilities shall conform to the requirements of Title 8, Industrial Relations, Subchapter 5, Electrical Safety Orders, California Administrative
1.03 WATER SUPPLY

A. General:

1. Contractor shall be responsible for providing water for construction and drinking purposes.

2. All costs associated with water supply shall be borne by the Contractor.

B. Construction Water:

1. Contractor shall be responsible for providing construction water.

2. The Contractor shall not make connection to or draw water from any fire hydrant or pipeline without first obtaining permission of the City or other authority having jurisdiction over the use of said fire hydrant or pipeline and from the agency owning the affected water system. For each such connection made, the Contractor shall first attach to the fire hydrant or pipeline a valve, backflow preventer, and a meter, if required by the City or other authority, of a size and type acceptable to the City or said other authority and agency.

3. The Contractor shall provide all facilities necessary to convey water from the water source to the points of use as required and in accordance with the requirements of the Contract Documents. Contractor shall provide and operate all pumping facilities, pipelines, valves, hydrants, storage tanks, and all other equipment necessary for the adequate development and operation of its water supply system.

4. Contractor shall be solely responsible for the adequate functioning of its water supply system and shall be solely liable for any claims arising from the use of same, including discharge or waste of water therefrom.

C. Potable Water: All drinking water on the site during construction shall be furnished by the Contractor and shall be bottled water or water furnished in approved metal dispensers. Notices shall be posted conspicuously throughout the site warning the Contractor's personnel that piped water may be contaminated. Water used for domestic purposes shall be free of contamination and shall conform to the requirements of the State and local authorities for potable water.

D. Removal of Water Connections: Before final acceptance of the Work on the project, all temporary connections and conveyance facilities installed by the
Contractor shall be entirely removed, and all affected improvements shall be restored to their original condition, or better, to the satisfaction of the Engineer, the City, and/or other agency owning the affected utility.

1.04 FIRE PROTECTION

The construction plant and all other parts of the Work shall be adequately protected against damage by fire. Contractor shall provide and maintain fire protection equipment including fire extinguishers, water supply and conveyance system, hose connections and hose, water casks, chemical equipment, or other sufficient means as required. The Contractor's fire protection program shall conform to the requirements of Article 36 of Cal-OSHA Construction Safety Orders.

1.05 SANITATION

A. Toilet Facilities: The Contractor shall provide sanitary temporary toilet buildings for the use of all workers. All toilets shall comply with local codes and ordinances. Toilets shall be kept supplied with toilet paper and shall have workable door fasteners. Toilets shall be serviced no less than once weekly and shall be present in a quantity of not less than 1 per 20 workers or as required by CAL-OSHA regulation. The toilets shall be maintained in a sanitary condition at all times. Use of toilet facilities in the Work under construction shall not be permitted. Any other Sanitary Facilities required by CAL-OSHA shall be the responsibility of the Contractor.

B. Sanitary and Other Organic Wastes: The Contractor shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of away from the site in a manner satisfactory to the Engineer and in accordance with all laws and regulations pertaining thereto.

1.06 COMMUNICATIONS

Telephone Services: The Contractor shall provide and maintain, at all times during the progress of the Work, telephone service. The Contractor shall pay for all costs associated with its telephone service. Cellular service will be an acceptable substitute for standard telephone service provided that the cellular telephone signal is adequate for voice communication.

1.07 VENTILATION

Ventilate enclosed areas to assist cure of materials, to dissipate humidity and to prevent accumulation of dust, fumes, vapors or gases. Provide temporary fan units as required to maintain clean air for construction operations.
1.08 SECURITY FENCES, ENCLOSURES AND BARRICADES

A. Project site, including areas used for material storage and equipment, shall be enclosed by security chain link or other approved fencing. Such fencing shall be at least six feet in height and shall be equipped with gates that can be securely locked at all times when work is not in progress. Similar security fencing shall be provided at work sites where Contractor’s operations have disturbed an existing perimeter enclosure. The Contractor is required to supplement existing walls and fences to maintain a complete perimeter security enclosure around all work sites when left unattended.

B. Provide temporary ladders, guards rails, and barricades as required and in accordance with applicable regulations, including California Code of Regulations, Title 8 and Cal/OSHA.

1.09 STORAGE AREA

A. The Contractor shall provide temporary off-site storage and yard areas as required.

B. The Contractor shall submit to the City agreements and/or letters of permission establishing the Contractor’s rights to use of the storage and yard areas and conditions of use.

1.10 TERMINATION AND REMOVAL

A. All temporary construction facilities and utilities shall be promptly removed after they are no longer required.

B. The Contractor shall complete and restore work that may have been delayed or affected by installation and use of temporary utilities, including repairs to construction and grades and restoration and cleaning of exposed surfaces.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall provide a temporary field office, equipment, and services specified herein for the Engineer or City at the project site during the entire time of construction beginning at the commencement date stated in the Notice to Proceed until the issuance of Notice of Completion of the Work by the City.

1.02 GENERAL FIELD OFFICE REQUIREMENTS

A. Required field office, equipped as specified herein, shall be provided at the site, ready for use by the City within 21 days after the commencement date stated in the Notice to Proceed. The Contractor's attention is directed to the condition that no payment for mobilization, or any part thereof, will be approved until all field office facilities specified herein, are provided. The provisions for such payment are specified under Paragraph "Payment for Mobilization" in Section titled "Measurement for Payment."

B. Unless released earlier by the Engineer in writing, said field office shall be maintained in full operation at the site with all utilities connected and operable until the Notice of Completion has been executed or recorded. Upon execution or recordation of the Notice of Completion, or upon early release of the field office by the Engineer, the Contractor shall remove the field office(s) within 10 days from said date, and shall restore the site occupied by said field office to the condition specified or shown on the Contract Documents for the subject area.

C. The Contractor shall furnish, install, and maintain power supply, electrical wiring, plumbing, toilet and lavatory fixtures, internet service, air conditioning and heating equipment, furniture, furnishing, light, potable water, and furnish regular janitorial services in connection with field office specified herein, for the duration of the Work.

PART 2 – PRODUCTS

2.01 ENGINEER’S FIELD OFFICE FACILITIES

A. The Contractor shall provide and maintain for the exclusive use of the Engineer and the City’s representative and personnel, one separate field office at
approximate location shown on the Drawing. Exact location shall be determined in field as agreed by the City.

B. The field office shall not be less than 168 square feet in area (8’ x 21’).

C. The field office shall be well-lighted, air conditioned and electrically heated.

D. The Contractor shall provide all furnishings, utility services, and equipment specified herein. The office shall be provided with an outside door lock. Said office shall be of the portable trailer type unless otherwise specifically authorized by the Engineer in writing and shall be a separate unit, not attached or connected to any other structures.

E. A separate toilet facility shall be provided for exclusive use of Engineer and City's personnel near field office. Exact location shall be determined in field as approved by the City. A flush-type chemical toilet with a holding tank shall be provided. All sanitary waste material shall be regularly pumped out and the chemicals recharged. A continuous supply of toilet paper and paper towels shall be provided for toilet facility.

2.02 FIELD OFFICE FURNISHINGS

The Contractor shall provide the following listed items in good condition for the Engineer's field office:

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard 30&quot;W x 60&quot;L desk with not less than 3 drawers</td>
<td>1</td>
</tr>
<tr>
<td>Standard foldable 72&quot;L x 30&quot;W x 29&quot;H tables for plans and conference</td>
<td>2</td>
</tr>
<tr>
<td>Typist chair, standard adjustable height and backrest, swivel with casters</td>
<td>2</td>
</tr>
<tr>
<td>Foldable office chair(s), stiff-leg type, no armrest</td>
<td>10</td>
</tr>
<tr>
<td>File cabinet, legal size, four drawers with lock and three keys, double suspension, complete with Pendaflex suspension racks for each drawer</td>
<td>1</td>
</tr>
<tr>
<td>Plan rack (all metal plan-hold type) capable of holding six sets of plans, complete with six standard all metal plan-hold clamps</td>
<td>1</td>
</tr>
<tr>
<td>Wastebaskets</td>
<td>2</td>
</tr>
<tr>
<td>Tack board 36&quot;H x 42&quot;L</td>
<td>1</td>
</tr>
<tr>
<td>Bookshelves</td>
<td>15 LF</td>
</tr>
<tr>
<td>Bottled water dispenser unit (supplying both hot and cold water) and bottled water service and continuous supply of paper cups</td>
<td>1</td>
</tr>
</tbody>
</table>
2.03 PRINT/COPY/SCAN/FAX MACHINE

A. The Contractor shall provide, for the exclusive use of the City, one combination copier/fax/scanner/printer, as well as supplies therefore, for the City's meeting room.

B. Copier shall be capable of reproducing original 8-1/2 x 11 and 8-1/2 x 14 originals on plain bond paper and capable of both full- and reduced size prints such that an 8-1/2 x 14 original can be copied on a sheet of 8-1/2 x 11 paper. The machine may be either single-feed or stack-feed type.

C. The copier/fax/scanner/printer shall be either hard-wired or remotely connected to the field office computer.

D. Maintenance and Supplies: The Contractor shall provide full maintenance and supplies, other than paper, for the equipment specified above, including all copy cartridges, toner, and other chemicals required for operation for the entire construction time.

2.04 APPURTENANCES AND MISCELLANEOUS ITEMS

A. The Contractor shall provide fire protection devices as required by the local applicable regulations.

B. Furnish all required appurtenances and miscellaneous items required for complete installation of the field office.

2.05 INTERNET LINE AND SERVICE

A. The Contractor shall install and maintain a high-speed internet connection including Wi-Fi with a minimum of 4 outlets, to be installed in the City's field office.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Location: Potential alternate sites for the Engineer’s field office are shown on the drawings. The Contractor shall coordinate with the Owner to determine preferred location of the field office.

B. Install field office at location approved by the Owner.

C. Install field office and pertinent items in accordance with supplier’s instructions.
D. Install specified furnishings and equipment.

E. Install specified utility equipment and services.

F. Install toilet facility.

G. Install fire protection devices as required by the local applicable regulations.

3.02 FIELD OFFICE ELECTRICAL SERVICE

A. The field office shall be provided with required temporary electrical power supply to power all equipment and lights furnished.

B. The electric distribution panel shall provide not less than two circuits providing 110 volt, 60-Hertz service.

C. The field office shall be provided with sufficient interior lighting throughout the office. Exterior lighting shall be provided over the entrance door.

D. A minimum of six 110-volt AC duplex electric convenience outlets shall be provided; at least one such outlet shall be located on each wall.

3.03 FIELD OFFICE JANITORIAL SERVICES

A. Regular janitorial services shall be provided for the Engineer’s field office during working hours as required, but not less than once a week. The office shall be swept, dusted, and waste receptacles emptied not less than once every week.

B. All sanitary waste material shall be regularly pumped out and the chemicals recharged.

C. A continuous supply of toilet paper and paper towels shall be provided for each toilet facility.

3.04 INTERNET SERVICE

A. Internet Line and Service: The Contractor shall furnish, install, maintain, and pay for a high-speed internet connection including Wi-Fi with a minimum of 4 outlets, to be installed in the City’s field office.

B. The copy/fax/scanner/printer required herein is for the exclusive use of the field office personnel of the City.
3.05 REMOVAL OF FACILITY

A. Remove temporary field office, equipment, furnishings, and all associated appurtenances and utility services per Paragraph 1.02.B.

B. Unless otherwise noted, restore site to the original condition.

END OF SECTION
SECTION 01 55 00
SITE ACCESS AND PARKING

1.01 GENERAL

The Contractor shall take all necessary precautions for the protection of the Work and the safety of the public. All barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise. The Contractor shall station such guards or flaggers and shall conform to such special safety regulations relating to traffic control as may be required by the public authorities within their respective jurisdictions. All signs, signals, and barricades shall conform to the requirements of Article 11 of Cal-OSHA Construction Safety Orders.

1.02 HIGHWAY LIMITATIONS

The Contractor shall make its own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress to and from the site of the Work. It shall be the Contractor's responsibility to construct and maintain any access or haul roads required for its construction operations.

1.03 TEMPORARY STREET USE

A. Street Use: Nothing herein shall be construed to entitle the Contractor to the exclusive use of any public street, alley, way, or parking area during the performance of the Work hereunder, and it shall so conduct its operations so as not to interfere unnecessarily with the authorized work of the City, utility companies, or other agencies in such streets, alleys, ways, or parking areas.

B. No street shall be closed to the public without first obtaining the permission of the Engineer, the City, and other proper governmental authority, where applicable. Where excavation is being performed in primary streets or highways, one lane of traffic shall be kept open in each direction at all times unless otherwise provided in the Contract Documents or under the terms of the permits issued by the City, County, State, or other public agencies, as required.

C. Toe boards shall be provided to restrict movement of excavated material if required by the Engineer, the City, or other Agency having jurisdiction over the affected street or highway.

D. Fire hydrants on or adjacent to the Work shall be kept accessible to firefighting equipment at all times.
E. Temporary provisions shall be made by the Contractor to assure the use of sidewalks and the proper functioning of all gutters, sewer inlets, and other drainage facilities.

F. Wherever necessary or required for the convenience of the public or individual residents or business places at street or highway crossings, private driveways, or elsewhere, the Contractor shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the Contractor shall secure the written consent of the individuals or authorities concerned to omit such temporary bridges or steel plates, which written consent shall be delivered to the Engineer prior to beginning the excavation. All such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation.

G. Temporary bridges or steel plates for street and highway crossings shall conform to the requirements of the authority having jurisdiction in each case, and the Contractor shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.

H. Traffic Control: For the protection of traffic in public or private streets and ways, the Contractor shall provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of the latest edition of the “California Manual of Uniform Traffic Control Devices (CA MUTCD)” Part 6 entitled Temporary Traffic Control. Traffic control shall be subject to the requirements of Article 11 of Cal-OSHA Construction Safety Orders. Contractor shall submit and gain approval of the Traffic Control Plan from the Engineer prior to implementation of the plan per section 01 55 26 Traffic Control Plan. Contractor to submit their Traffic Control Plan to the Engineer for approval within 14 days after Notice of Award per specification section 01 32 19 Contractor Submittals.

1.04 TEMPORARY STREET CLOSURE

If closure of any street is required during construction, a formal application for a street closure shall be made to the City and/or other authority having jurisdiction at least 30 days prior to the required street closure in order for the City and other agency having jurisdiction to determine the necessary signing and detour requirements to be provided by the Contractor.

1.05 ACCESS TO EXISTING FACILITIES

Access to all existing facilities to be kept in operation shall not be blocked and shall be kept clear. Unless otherwise noted, all existing facilities are required to remain in operation.
1.06 PARKING

A. Vehicles shall not be parked in any unauthorized place or in an unsafe manner.

B. Vehicles shall not be parked such that they block existing driveways.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall prepare detailed temporary traffic control plans for the protection of traffic in public or private streets and submit to the City and Engineer for review and acceptance.

B. The Contractor shall install temporary traffic signals and connections and flaggers, signs, delineators, striping, barriers and other traffic control devices necessary to perform all temporary traffic control for the project as specified in the Contract Documents, as required by the City, and as required to complete the work.

C. The Contractor shall erect and maintain all construction signs, warning signs, detour signs, and other traffic control devices necessary to warn and protect the public at all times from injury or damage as a result of the Contractor's operations which may occur on highways, roads, or streets.

D. Install at least two Portable Changeable Message Signs as approved by the City.

E. The Contractor shall remove temporary traffic controls after they are no longer required.

1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. The latest edition of the publications listed below form a part of this Specification to the extent referenced. The publications are referred to by the basic designations only.

1. State of California Department of Transportation Standard Plans and Standard Specifications

2. California Manual of Uniform Traffic Control Devices (California MUTCD)

4. Section 7-10 “Public Convenience and Safety” of the Standard Specifications as amended by the provision of this Section as well as the City’s Road Standards latest edition, Plates 1-7, 1-8, 8-15 and 8-16.


6. As required by the City.

1.03 RELATED WORK

A. Temporary Utilities are included in Section 01 51 00.
B. Trench Backfill and Compaction are included in Section 02 22 00.
C. Pavement and Base are included in Section 02 51 20.
D. Slurry Seal is included in Section 02 51 30.
E. Pavement Striping and Markings are included in Section 02 52 50.
F. Steel Pipe and Fittings are included in Section 02 62 00.
G. Small Diameter PVC Pipe and Fittings are included in Section 02 63 00.

1.04 SUBMITTALS

A. Submit traffic control plans for all construction operations affecting traffic in public or private streets. All traffic control plans submitted by the Contractor shall be signed and stamped by a professional engineer registered in the State of California.

B. Name and qualifications of the appointed Traffic Control Manager (TCM). Qualifications must demonstrate an individual's ability to perform the tasks assigned. The TCM must have a minimum of 5 years recent and continuous field experience performing the duties, at a minimum, indicated in this section.

C. Portable Changing Message Signs.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All traffic control such as markers, delineators, barricades, temporary and permanent traffic lines, signs, etc. shall be in accordance with the California
MUTCD and Caltrans Standard Plans and Specifications. Crash cushions shall additionally be specifically approved by Caltrans.

B. Portable changeable message signs shall be in accordance with Caltrans Standard Specifications Section 12-3.12.

C. Steel plates, where allowed in the Contract Documents, shall be supplied and designed to withstand H-20 traffic loading over the excavation area. Top surface of steel plates that are subject to traffic shall receive a skid-resistant coating that passes the California Test Method 342, such as SkidGuard as manufactured by Carbonyte or an approved equivalent. Steel plates shall additionally be recessed and pinned.

D. All materials shall be new or used in good working order. Materials that are determined to be unsatisfactory by the City or agency having jurisdiction shall be removed from the Site.

E. Dimensions of traffic control signs shall be in accordance with the California MUTCD and Caltrans Standard Plans and Specifications. Oversized signs (signs larger than those dimensioned in the aforementioned documents) shall only be used if approved by the Engineer and City.

F. Temporary pavement markers shall be of the plastic peel-and-stick variety, yellow in color, reflective on both sides, and have a strong enough adhesive to withstand repeated encounters with vehicle tires. Removable covers may be used if staining of the temporary pavement markers from vehicular traffic will cause them to lose their reflective properties. Blue markers shall be installed to indicate location of fire hydrants.

PART 3 - EXECUTION

3.01 TEMPORARY TRAFFIC CONTROL PLAN SUBMITTAL AND APPROVAL

A. The Contractor shall prepare detailed temporary traffic control plans for the protection of traffic in public or private streets and submit to the City and Engineer for review and acceptance. Traffic control shall be subject to the requirements of Article 11 of Cal-OSHA Construction Safety Orders and in accordance with the requirements of the “California Manual of Uniform Traffic Control Devices (CA MUTCD)” Part 6 entitled Temporary Traffic Control and as supplemented herein. Prepare and submit traffic control plans for all construction operations affecting traffic in public or private streets. These may include, but are not limited to the following:

1. Excavation and trenching
2. Belowground utility installation, modification, repair and associated work
3. Potholing
4. Temporary and permanent pavement removal, modification, or installation
5. Installation of slurry seal
6. Pavement striping
7. Aboveground facility construction, modification, or repair
8. Removal of existing or installation of landscaping
9. Delivery of material

B. The Contractor shall submit to the Engineer within 21 calendar days of publication of the Notice of Award. Traffic control plan shall be prepared for each type of construction activity and in accordance with the requirements of this Section. The traffic control plan shall be a detailed plan showing the proposed stage construction, all stages of work planned within the construction site, and must include all signage and the specific wording proposed for each sign, solar-powered arrow boards, delineators, barricades, etc. This traffic control plan must be prepared by a registered Civil/Traffic Engineer or a professional traffic handling firm on a minimum of 11-in. x 17-in. blueprints and will be an included cost in the bid items on traffic control. Any changes requested by the Engineer shall be incorporated into the traffic control plans prior to issuing any permits.

C. The Traffic Plan shall be designed to handle traffic safely 24 hours per day, seven days per week for the duration of the Work. Traffic deviations, detours, and roadway closures shall be coordinated by the Contractor with Police and Fire authorities a minimum of 24 hours in advance of implementation.

D. Portable Changeable Message Signs shall be as required by the City (see 3.03 below).

E. During construction, if the Contractor should request any changes to the traffic control plans accepted by the City, the Contractor will be required to prepare revised traffic control plans and submit them to the Engineer and the City for review and approval.

F. No work shall be performed that requires placement of temporary traffic controls until the plans are reviewed and accepted by the Engineer and the City.

3.02 GENERAL

A. The Contractor shall adhere to the temporary traffic control as approved by the City and as specified herein.

B. Travel Lanes: In addition to the requirements of the Standard specifications governing traffic, detours, and access, the Contractor shall conform to the following supplementary requirements:
1. Contractor shall continuously maintain a minimum of one safe, unimpeded travel lane in each direction of the project.

2. If a street or lane must be completely closed for proper construction operations, prior approval of the Engineer shall be obtained. Applications for a street closure shall be made to the authority having jurisdiction at least 30 days prior to the street closure in order to determine necessary signing and detour requirements.

3. All traffic lanes shall have a minimum width of 11 feet, unless otherwise specified. In addition to a lane width specified herein, the Contractor shall maintain a minimum clearance of 5 feet to excavations and a minimum clearance of 2 feet to curbs, barricades, and other vertical obstructions.

4. The disruption of normal traffic patterns and the inconvenience to the public shall be held to as short a time as is practicable. In this interest, the Contractor shall submit for the Engineer’s approval prior to any traffic rerouting, a time schedule for those stages of construction making such rerouting necessary.

C. The Contractor shall be responsible for providing adequate flaggers, signs, delineators, striping, and other traffic control devices for the protection of the Work and the public at all times. Necessary traffic control devices shall be provided by Contractor to avoid ingress and egress of traffic from non-designated areas within the construction zone.

D. The Contractor or his independent third-party traffic control company shall install, have operational, and maintain all required traffic control devices at all times during construction.

E. Initial temporary traffic control setup and takedown shall be performed by a California licensed C-31 contractor. Daily maintenance, not including relocation or addition of any traffic control devices to new locations, does not require a California C-31 license.

F. The Contractor shall strictly observe the Contract designated work hours. Work, including any traffic control modifications, must be started and completed within the designated work days and hours specified in the Contract Documents.

G. All traffic control setups and takedowns shall be fully completed during the Contractor’s allowed work time hours. Setting up or installing any traffic controls or traffic control devices during non-work time hours or hours not specifically designated for traffic control setup or installation is strictly prohibited.
H. All traffic control devices shall be kept in their proper position at all times, and shall be repaired, replaced, or cleaned as necessary to preserve their appearance and continuity.

I. Blue reflective bidirectional pavement markers shall be installed at each fire hydrant on the fire hydrant side of the roadway. This applies in areas where the traffic lane(s) have been shifted in such a manner that makes it difficult for the existing blue pavement marker to be seen by emergency vehicles from the temporary traffic lane.

J. Yellow temporary pavement markers shall be installed on temporary centerlines for traffic controls to be used longer than 24 hours. Markers shall be placed a maximum of 20 feet apart. Temporary pavement markers that have been damaged, destroyed or defaced in such a manner to lose its reflective properties shall be replaced.

K. All flashing and other traffic control lights shall be shielded such as to prevent shining of lights to nearby residences.

L. Traffic control shall only be used for the immediate construction work. Traffic control shall not be installed only for the staging and storage of materials other than as shown on the Drawings or approved by the City in writing.

M. Contractor shall provide the City Traffic Engineer with minimum 48 hours’ notice prior to needing any modification of existing traffic signals (placed into flash, etc.) as may be needed to support their proposed Traffic Control Plan.

3.03 PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS)

A. At least two Portable Changeable Message Signs shall be furnished and installed. The two PCMS shall be installed and maintained throughout the course of the La Granada Pipeline construction period.

B. The wording on the signs will be determined by the City. Contractor shall program messages and place in locations as directed by the City, including periodic relocations as required.

C. The Contractor shall maintain the signs in good condition and operational 24/7 throughout the required period until the time approved by the City for their removal.

D. The cost for the PCMS’s shall be the responsibility of the Contractor. PCMS’s shall be installed at least two weeks prior to start of the field activities/construction. If Contractor fails to place PCMS’s within the specified
time frame, the City will place the PCMS’s, and the incurred cost will be deducted from the Contractor’s due progress payments.

E. Locations of PCMS shall be as approved by the City.

3.04 TRAFFIC CONTROL MANAGER

A. The Contractor shall designate an individual or individuals to perform the duties of Traffic Control Manager (TCM). The Contractor shall identify an alternate TCM that can assume the duties of the assigned or primary TCM in the event of that person’s inability to perform. Such alternates shall be adequately trained and certified to the same degree as the primary TCM. A TCM must be present at the Site during times when the Contractor requires traffic controls and is performing construction work.

B. The Contractor shall maintain 24-hour telephone numbers at which the TCM can be contacted and be available upon the Engineer’s or City’s request outside normal working hours. The TCM shall have the appropriate personnel, equipment and material available at all times in order to expeditiously correct any deficiency in the traffic control system.

C. The duties of the Traffic Control Manager shall include:

1. Discussing proposed traffic control measures and coordinating implementation of the Contractor-adopted traffic control plans(s) with the City and Engineer.

2. Coordinating all traffic control operations, including those of the traffic control subcontractor, other subcontractors, suppliers, and any adjacent construction or maintenance operations.

3. Coordinating the project’s activities (such as ramp closures, road closures, and lane closures) with appropriate police, fire control agencies, city, medical emergency agencies, school districts, and transit companies.

4. Overseeing all requirements of the contract that contribute to the convenience, safety, and orderly movement of vehicular and pedestrian traffic.


6. Attending all project meetings where traffic management is discussed.
7. Keep daily diaries of traffic control setup and be responsible for knowing “field” traffic control operations.

8. Inspecting traffic control devices and nighttime lighting for proper location, installation, message, cleanliness, and effect on the traveling public. Traffic control devices shall be inspected each work shift. Traffic control devices left in place for 24 hours or more shall also be inspected at least once during the nonworking hours when they are initially set up (during daylight or darkness, whichever is opposite of the working hours).

9. Inspecting traffic control devices to determine if corrections should be made due to the traffic controls not functioning as required. The TCM shall notify the City to obtain approval prior to revising the traffic control plan. Any recommendations for change by the TCM shall be in accordance with referenced documents in Paragraph 1.02 herein.

10. Attending traffic control coordinating meetings or coordination activities.

3.05 SAFETY AND HEALTH PROVISIONS

A. General. Attention is directed to Section 7-1.06 of the Standard Specifications and the provisions thereof. Cal-OSHA requirements and the provisions of the "Permit to Excavate" obtained by the Contractor from the State Division of Industrial Safety shall be complied with.

B. Public Safety During Non-Working Hours. Notwithstanding the Contractor's primary responsibility for safety on the jobsite when the Contractor is not present, the Engineer at his option after attempting to contact the Contractor may direct City forces to perform any functions he may deem necessary to ensure public safety at or in the vicinity of the job site. If such procedure is implemented, the Contractor shall bear all expenses incurred by the City.

C. Open Trenches and Holes. No open trenches or open holes are allowed during non-working hours. All trenches and open holes shall be backfilled or properly plated during non-working hours.

3.06 INSTALLATION

A. Without written permission from the City, the Contractor may not install any temporary traffic controls in the public right-of-way prior to having all materials (pipe, fittings, conduits, etc. as applicable) on site or at a local storage yard that are necessary to complete the work to be constructed under that traffic control set up.

B. No work will be allowed within the traveled way until all required traffic control devices and personnel are in place.
C. Required construction signing, lighting and barricading shall be provided as required by City Standards or as directed by the Engineer. As a minimum, all construction signing, lighting and barricading shall be in accordance with the State of California, Department of Transportation, "California Manual of Uniform Traffic Control Devices" (CA MUTCD).

D. All warning and directional signs, barricades, lights, fences, and other such devices shall be installed, constructed, and maintained in accordance with the State of California, Department of Transportation, "California Manual of Uniform Traffic Control Devices" (CA MUTCD), or to the ordinances and regulations of the City of Thousand Oaks or County or Ventura, as applicable. All signs, signals, and barricades shall conform to the requirements of Cal-Osha.

E. Work must be underway when temporary traffic control is set up. If work ceases for more than 3 Working Days, the temporary traffic control shall be removed and the road restored to its original condition until the Contractor is ready to resume work.

F. All temporary traffic control signs shall be removed or completely covered with either metal or plywood during periods when they are not needed. When the need for any of these signs has ceased, the Contractor shall take down these signs, posts or supports.

G. All signs shall be reflective to be readable at night.

H. Traffic plates placed within the traveled way shall be non-skid treated and have the top of the plate at the same level as the top of the finished surface and shall be pinned. Gaps between the edge of the plate and the finished surface shall be filled with asphalt cement.

I. Any traffic plate placed on the finished paved surface within the traveled way shall be placed against temporary asphalt or other such material to provide a smooth transition from the finished surface and the top of the plate.

J. Signs, posts, or supports that are lost, stolen, damaged, destroyed, or which the City deems to be unacceptable, while their use is required on the Work, shall be replaced by the Contractor without additional compensation.

K. Traffic control loops or sensors damaged or removed by the Contractor shall be replaced and put into service immediately following relocation of the traffic control outside the area affecting the traffic control loop. Removal of the traffic control loop will be required for the subsequent street overlay work. If the street overlay will be placed within two Working Days of relocation of the traffic
control outside the area affecting the traffic control loop, then the traffic control loop may be placed after the overlay is completed.

L. Trim or clear vegetation as minimally required to allow safe passage of vehicles and pedestrians. Contractor shall notify the City 7 Calendar Days in advance of any vegetation clearing or trimming. If requested by the City and at no additional charge to the City, mark vegetation to be trimmed or cleared with distinguishable flags, tape, rope, or other non-permanent method such that the City may easily identify affected area.

M. At any previously uncontrolled intersection, which hereupon shall become a controlled intersection as a result of the project, the following shall apply. The Contractor shall provide and install new stop signs, posts, and sleeves on all legs of the intersection in conjunction with, and at the same time as, the painting of all stop bars and legends per City Standard Drawings. All signing, striping, and legends shall be permanently and concurrently installed on all legs of the intersection on the same day at any one location.

N. All existing striping, markings, markers, signs, etc. which were altered, removed, damaged, covered, or otherwise modified during construction shall be returned to equal or better condition and in their preconstruction locations regardless if shown on the Drawings or not. Measurements and documentation of all existing traffic controls, including striping, markings, signs, and markers, shall be taken prior to modification for accurate replacement.

O. Adequate drainage facilities shall be provided to maintain the traveled pavement surface in a condition free from ponded or running water. Water shall not be diverted from existing courses or ponded onto private property without the express written permission of the property owner.

P. The Contractor shall maintain access to all property during construction, except, that access may be restricted during working hours upon obtaining the written approval of the City. Access to commercial properties shall be maintained at all times.

Q. The Contractor may post "No Parking" signs along the site of the work. The Contractor shall furnish and install said "No Parking" signs and remove when not required. Contractor is responsible to coordinate directly with the Police Department regarding enforcement of the "No Parking" signs, including any potential towing of vehicles, as required.

3.07 EQUIPMENT MOVING

When moving construction equipment from one construction location to another, a pilot vehicle shall be provided to lead all construction equipment. Flashing lights, flags and warning signs shall be used as necessary to ensure
public safety. All costs for equipment moving, including cost of permits by non-City agencies, shall be included in the prices for all bid items in the Bid Schedule and no additional payment will be made therefor.

3.08 REMOVAL

The Contractor shall promptly remove all temporary traffic control material and devices after they are no longer required.

END OF SECTION
SECTION 01 56 00
TEMPORARY ENVIRONMENTAL CONTROLS

1.01 EXPLOSIVES AND BLASTING

The use of explosives on the Work will NOT be permitted.

1.02 DUST ABATEMENT

The Contractor shall furnish all labor, equipment, and means required and shall carry out effective measures wherever and as often as necessary to prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The Contractor shall be responsible for any damage resulting from any dust originating from its operations. The dust abatement measures shall be continued until the Contractor is relieved of further responsibility by the Engineer.

1.03 RUBBISH AND DEBRIS CONTROL

During the progress of the Work, the Contractor shall keep the site of the Work and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish and debris. These include La Granada Pump Station site, access roads, trails, Mountain Crest Circle, La Granada Drive, and other streets and areas used by the Contractor. The Contractor shall dispose of all rubbish, debris, and waste materials of any nature occurring at the Work site and shall establish regular intervals of collection and disposal of such materials and waste. The Contractor shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish, debris, and surplus materials shall be off the site of construction in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws and to the particular requirements of Article 3 of Cal-OSHA Construction Safety Orders. Contractor shall use only the City’s authorized haulers. The Contractor can visit www.toaks.org/GoGreen for a list of authorized waste haulers.

1.04 SANITATION

A. Toilet Facilities: Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Article 3 of Cal-OSHA Construction Safety Orders.
B. **Sanitary and Other Organic Wastes:** The Contractor shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of away from the site in a manner satisfactory to the Engineer and in accordance with all laws and regulations pertaining thereto.

### 1.05 CHEMICALS

All chemicals used during project construction or furnished for project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer.

### 1.06 WATER POLLUTION CONTROLS

A. All work shall be undertaken in accordance with the conditions and requirements of the Ventura Countywide Stormwater Quality Management Program, National Pollutant Discharge Elimination Systems (NPDES) Permit No. CAS004002. The contractor shall employ all necessary NPDES best management practices in accordance with the Countywide Stormwater Program "Stormwater Pollution Control Guidelines for Construction Sites" booklet (latest version), the State Stormwater Task Force "BMP Handbooks" and/or other approved reference documents cited in Permit No. CAS004002.

B. At all times work shall proceed using due diligence to safeguard against deposition of sediment, debris, concrete sawcut effluent, and other polluting matter into the street, storm drain and/or associated drainage conveyances. The storm drain system shall not be used for the disposal of any wastes including, but not limited to, wastewaters associated with the cleaning and/or sensing of equipment, streets or walkways (MC 7-8.302).

C. Contractor shall not stockpile debris, spoils, dirt, earth, trees, or any other materials on the project limits or at the associated project staging areas. These include La Granada Pump Station site, access roads, trails, Mountain Crest Circle, La Granada Drive, and other streets and areas used by the Contractor.

D. Contractor shall provide daily mechanical motorized vacuum sweeping of all paved areas of the project, as well as daily watering of all unpaved areas, for the duration of the project. The use of a kick-broom shall not be permitted.
1.07 EROSION CONTROLS

A. Contractor shall comply with the City of Thousand Oaks Grading Ordinance (Title 7, Chapter 3 of the City of Thousand Oaks Municipal Code).

B. City of Thousand Oaks Grading Ordinance recognizes that the period between November 1 and April 15 to be the period in which heavy rainfall normally occurs in the City. During this period contractor shall incorporate temporary erosion control devices to protect any property adjacent to the project, and the project work.

C. Contractor shall submit plans for erosion control to the Project Representative and obtain design approval before the work starts. Said plans shall show adequate anti-erosion and drainage devices, i.e., check dams, retention and desilting basins, berms, or other devices necessary to protect public streets and property of others from damage of water run-off and erosive forces. Contractor shall have all drainage devices shown on plans in place at the end of each working day when the forecast of rain probability is 40% or greater.

D. The contractor shall maintain drainage within and through the work areas. Earth dams will not be permitted in paved areas. Temporary dams of sandbags, asphaltic concrete or other acceptable material will be permitted when necessary to protect the work, provided their use does not create a hazard or nuisance to the public. Such dams will be removed from the site as soon as their use is no longer necessary.

E. Contractor shall clean out mud and silt after each rain or as directed by the Project Representative.

F. Construction will not be allowed to proceed under any circumstance if contractor does not comply with erosion control requirements.

END OF SECTION
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SECTION 01 58 00

PROJECT IDENTIFICATION

PART 1 - GENERAL

1.01 GENERAL

A. The Contractor shall construct, erect, and maintain three, rectangular (4 ft. by 8 ft.), painted construction signs prominently displayed at the locations determined by the Owner.

B. Said sign shall be up to 4 colors and contain up to 2 project logos. Signs shall be installed within 14 days of receipt of the Notice to Proceed, and the Contractor shall maintain the signs in good condition until the execution of the Notice of Completion.

C. Project signs shall be ground mount and/or movable mount type as noted herein.

1.02 SUBMITTAL

A. Submit project sign layout and lettering.

B. Submit project sign and support fabrication details with dimensions, sizes, material grade, etc. for each type of sign.

PART 2 - PRODUCTS

2.01 SIGN

A. Signboard: The signboard shall be constructed of a single sheet of ¾” thick High Density Overlay exterior type plywood, Grade Designation APA HDO EXT. The signboard shall be trimmed to 4 ft. by 8 ft and shall be of all new material.

B. Ground Mount Sign Supports: Ground mount sign supports shall be in accordance with Project Sign Details included as Appendix D in the Specifications.

C. Movable Mount Sign Supports: Movable mount sign supports shall be in accordance with Project Sign Details included as Appendix D in the Specifications.
2.02  FABRICATION

A. The signboard shall be securely bolted to the support posts using three 5/16-inch minimum. carriage bolts through each signpost, with the smooth bolt head located at the face of the sign.

B. See Project Sign Details included as Appendix D for additional requirements.

2.03  PROTECTIVE COATING

A. All paint shall be weatherproof, non-fading enamel. Signboard surface shall be prepared with an enamel under coat prior to application of the base coat.

B. Sign support members shall be treated with linseed replacement oil tinted with redwood stain.

2.04  SIGN LETTERING AND LAYOUT

A. The sign lettering and layout shall conform to the details for the Project Identification Sign as shown in Appendix D.

B. The City will provide Contractor with a Digital City Logo to be used for the Project Identification Signs.

C. At the completion of the project, the signs shall be removed and disposed of by the Contractor.

D. The Contractor may place its name and/or logo in the lower right corner area of the sign in lettering not larger than that of the City Logo. The sign planning, appearance, and layout shall substantially conform to the sketch included in these documents and shall be subject to the approval of the Engineer. No work on the Project Sign shall be started until a final approved sketch is agreed upon.

2.05  TYPE AND TOTAL NUMBER OF PROJECT SIGNS

A. One Ground Mount type project sign shall be furnished and installed.

B. Two Movable Mount type project signs shall be furnished and installed.
PART 3 - EXECUTION

3.01 ERECTION

A. General:

1. Sign shall be located such that it will not be subject to damage from equipment or vehicles working at the project site.

2. One Ground Mount type sign shall be located near Mountain Crest Circle cul-de-sac.

3. Two Movable Mount type signs shall be located along east side of La Granada Drive where 10-inch and 18-inch water pipelines are to be installed.

4. Exact location of the moveable signs shall be determined in field as directed by the Owner, but in general it shall be installed near major work area and moved as work progresses.

B. See Appendix D for additional requirements.

C. The signs shall be placed into position as a part of the work of mobilization, as specified in Section entitled “Measurement & Payment”.

3.02 SIGN MAINTENANCE

Project sign shall be maintained in good condition by the Contractor at all times during the entire construction time. In case of damage to the sign from any cause, including environmental conditions and fading, the Contractor shall repair, re-erect, repaint, and/or install new sign, as required. All such repair or maintenance shall be completed promptly within five days of any such damage to the full satisfaction of the Engineer.

END OF SECTION
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1.01 GENERAL

The word "Products" as used herein is defined to include purchased items for incorporation into the Work, regardless of whether specifically purchased for project or taken from Contractor's stock of previously purchased products. The word "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form units of work. The word "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, etc.). Definitions in this paragraph are not intended to negate the meaning of other terms used in Contract Documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," "special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.

1.02 QUALITY ASSURANCE

A. Source Limitations: To the greatest extent possible for each unit of work, the Contractor shall provide products, materials, or equipment of a singular generic kind from a single source.

B. Compatibility of Options: Where more than one choice is available as options for Contractor's selection of a product, material, or equipment, the Contractor shall select an option that is compatible with other products, materials, or equipment already selected. Compatibility is a basic general requirement of product/material selections.

1.03 SERVICING OF EQUIPMENT

All equipment designated to be installed in the Work, whether temporarily stored at the site or installed in place, shall be serviced on a regularly scheduled basis, and a written log of services shall be maintained and submitted as a record document to the Engineer.

END OF SECTION
1.01 WORK INCLUDED

Manufacturer’s field services shall be provided for equipment specified in this Section, where specified in individual Specifications sections and where required to complete the work. Scheduling of these services must be performed by the Contractor and coordinated with the City and manufacturer’s representative(s).

1.02 SUBMITTALS

A. Quality Control Submittals:

1. Certificate of qualification of manufacturer's representative during shop drawing submittal phase.

2. Manufacturer's Certificate of Proper Installation.


1.03 QUALIFICATION OF MANUFACTURER’S REPRESENTATIVES

Authorized representatives of the manufacturer, factory trained, and experienced in the technical applications, installation, operation, and maintenance of respective equipment, subsystem, or system. Representatives are subject to acceptance by the City. No substitute representatives will be allowed unless prior written approval by the City has been given.

1.04 EQUIPMENT AND SYSTEMS

A. Equipment furnished shall include the cost of competent representative of the manufacturers of all equipment to supervise the installation, adjustment and testing of the equipment and to instruct the City’s operating personnel on operation and maintenance where specified herein.

B. Equipment requiring manufacturer’s field services during installation, testing, start-up, and training/instruction are as following, but not limited to:
### Equipment Installation, Testing, Start-up, Training/Instruction, Section Number

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### 1.05 FULFILLMENT OF SPECIFIED MINIMUM SERVICES

A. Where manufacturer’s services are specified, furnish manufacturer's representatives qualified to provide these services.

B. Schedule manufacturer’s field services to avoid conflicting with other field testing or other manufacturer's field services unless they are from related or connecting components.

C. Manufacturer's services shall include at a minimum the following:

1. Coordinating with the Contractor and the City as required to schedule each field service to be provided under these Contract Documents.
2. Assistance during installation to include observation, guidance, and instruction of Contractor's assembly, erection, installation or application procedures.

3. Inspection, checking, and adjustment as required for equipment to function as warranted by manufacturer and necessary to provide written approval of installation.

4. Revisiting the work site as required to correct problems and until installation and operation are acceptable to the City.

5. Resolution of assembly or installation problems attributable to or associated with respective manufacturer's products and systems.

6. Supervision of start-up and field testing until acceptance by the City.

7. Provide Manufacturer's Certificate of Proper Installation with applicable certificates for proper installation and initial, interim, and final test or service. The Contractor is responsible for performing all work and coordination necessary to obtain the certificate of proper installation.
   a. Certificate shall contain the following specific wording:

   "The [Name of Equipment] has been properly installed, tested, adjusted, lubricated, and calibrated, and is ready for full-time operation. The installation has been inspected and has been found to be in conformance with our (the manufacturer's) standards and requirements."

8. Provide training to the City's staff for specified equipment.

1.06 TRAINING SCHEDULE

A. The Operations and Maintenance Manuals must be submitted in accordance with Section 01 32 19, favorably reviewed before the training is scheduled, and made available to the City at the training session.

B. The City shall be given at least 10 Calendar Days' advance notice of training for a particular system or equipment and the Contractor shall only provide such notice after the system or equipment has been proven functional and the corresponding O&M manual has been accepted by the Engineer.

C. Coordinate training schedule to ensure training of appropriate personnel as deemed necessary by the City and to allow full participation by manufacturer's representatives. Adjustments to the schedule may be necessary depending on the City's operational needs. Training which requires interruptions in the
operability of equipment may be delayed at the discretion of the City. No Extra Work will be granted to the Contractor for such delay.

D. Provide trained, articulate personnel who are familiar with operation and maintenance data to coordinate and expedite training and to be present during training coordination meetings with the City.

E. Furnish manufacturer’s representatives to provide detailed training to City's personnel on operations and maintenance activities associated with the equipment.

1. Training shall be performed on-site and include demonstrations using fully operational equipment.

2. Training services shall include pre-startup classroom instruction, post-startup classroom instruction, and on-site, hands-on training on all equipment.

3. The submitted Operations and Maintenance Manuals shall be utilized when conducting the training sessions.

END OF SECTION
1.01 GENERAL

A. Furnish all labor, materials and incidentals required to provide shipment, handling, storage, and protection of material and equipment products.

B. The Contractor shall confine all operations (including storage of materials) on City premises to areas authorized or approved by the City. The Contractor shall hold and save the City, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor’s performance.

C. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the City and shall be built with labor and materials furnished by the Contractor without expense to the City. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the Work. With the written consent of the Engineer, the buildings and utilities may be abandoned and need not be removed.

1.02 CONTRACTOR’S WORK AND STORAGE AREA

A. The City will designate and arrange for the Contractor’s use, a portion of the property adjacent to the Work for its exclusive use during the term of the contract as a storage and staging area for its construction operations relative to this contract.

B. The Contractor shall provide any additional off-site area for staging and storage or other purposes, as required, at its own expense.

1.03 PREPARATION FOR SHIPMENT

A. Preservation, packaging, packing, and marking furnished by the supplier shall provide protection for a minimum of one year and provide for multiple handling and shipment.

B. Items shall be free of dirt and other contaminants which would contribute to the deterioration of the item or which would require cleaning by the City prior to use.

C. Items susceptible to corrosion or deterioration shall be provided protection, such as preservative coatings, volatile corrosion inhibitors, desiccants,
waterproof and/or vaporproof barriers. Special coatings shall be as required in individual Specifications Sections.

D. Package materials and equipment to facilitate handling and protect from damage during shipping, handling and storage.

E. Material shall be protected by providing adequate supports, wrapping, cushion, separators, blocking, tie-downs, or other similar means, as required to mitigate shocks and vibration and prevent damage during shipping, handling and storage.

F. Factory test results shall be reviewed and accepted by Engineer before product shipment as required in individual Specifications Sections.

G. When practical, factory assemble products. Matchmark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with a strippable protective coating.

H. Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, project information, Contractor’s name, equipment number, and approximate weight. Include complete packing lists and bills of materials with each shipment.

I. Spare Parts, Special Tools, and Maintenance Materials:

1. Furnish as required by the Specifications prior to operation of the equipment by the City.

2. Properly package to avoid damage, in original cartons insofar as possible. Replace parts damaged or otherwise inoperable.

3. Firmly affix to and prominently display on each package.
   a. Minimum 3- by 6-inch manila shipping tag with the following information printed clearly with permanent ink:
      1) Manufacturer’s part description and number
      2) Applicable equipment description
      3) Quantity of parts in package
      4) Equipment manufacturer
      5) Applicable Specifications Section
      6) Name of Contractor
      7) Project information
1.04 DELIVERY

A. Products shall be transported by methods to avoid product damage.

B. Deliver products in undamaged condition, in manufacturer’s original container or packaging, and with identifying labels intact and legible. Include on label, date of manufacture and shelf life, where applicable. Include UL labels on products so specified.

C. Deliver materials, parts and equipment to the Site unless otherwise specified. Unless otherwise specified, the Contractor shall pickup and deliver City provided items, materials, and equipment.

1.05 RECEIVING AND INSPECTION

A. Upon receipt of products at the Site, Contractor shall inspect the product to assure:

1. Product complies with requirements of the Contract Documents

2. Quantities are correct

3. Product is complete

4. Containers and packages are intact

5. Labels and delivery tickets are included and legible

6. Product is properly protected and undamaged

B. Contractor shall expedite replacement of damaged, incomplete, or lost items.

1.06 HANDLING

A. Handling and unloading of materials and equipment shall be in accordance with manufacturers’ written recommendations and as required in individual Specifications Sections and shall be performed to avoid any damage.

B. Coordinate off-loading of materials and equipment delivered to the Site. If necessary to move stored materials and equipment during construction, relocate materials and equipment at no additional cost to the City.

C. Provide equipment and personnel necessary to handle products, including those provided by the City, by methods that prevent damage to products or packaging.
D. Provide additional protection during handling as necessary to prevent breaking, scraping, marring, or otherwise damaging products or surrounding areas.

E. Products with lifting lugs and heavy components shall be handled only at designated lifting points.

F. Any damaged materials, equipment or parts shall be replaced to the satisfaction of the City.

1.07 STORAGE AND PROTECTION

A. The Contractor is solely responsible for securing all materials stored on or off the Site.

B. Storage and protection of materials and equipment shall be in accordance with manufacturers' written recommendations and requirements of other Sections of these Specifications where noted.

C. Sensitive products shall be stored in weather-tight enclosures and temperature and humidity ranges shall be maintained within those required by the manufacturer's written instructions.

D. The Contractor shall provide humidity control and ventilation for sensitive products as required by manufacturer's written instructions.

E. Exterior storage of fabricated products shall be placed on sloped supports above ground. Products subject to deterioration shall be covered with impervious sheet covering; ventilation shall be provided to avoid condensation.

F. Loose granular materials shall be stored on solid surfaces in a self-drained area and shall be prevented from mixing with foreign matter.

G. Make necessary provisions for safe storage of materials and equipment.

H. Keep materials and equipment neatly and compactly stored in locations that will cause minimum inconvenience to City personnel, other contractors, and public travel. Arrange storage to provide easy access for inspection.

I. Restrict storage to areas available on the Site for storage of material and equipment as shown on the Drawings or as approved by the City.

J. Provide off-site storage and protection when on-site storage is not adequate.

K. Protect stored materials and equipment against loss or damage.
1.08 MAINTENANCE OF STORAGE

A. Stored products shall be periodically inspected on a scheduled basis. The Contractor shall maintain a log of inspections and shall make said log available to the Engineer upon request.

B. The Contractor shall verify that storage facilities comply with manufacturer's written product storage requirements.

C. The Contractor shall verify that manufacturer-required environmental conditions are maintained continually.

D. The Contractor shall verify that surfaces of products exposed to the elements are not adversely affected and that any weathering of finishes is acceptable under requirements of Contract Documents.

1.09 PRODUCT REPLACEMENT

Any product that has been found to be damaged or unacceptable during delivery or subsequent inspection, handling or storage shall be promptly replaced with new in kind and to the satisfaction of the City.

END OF SECTION
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SECTION 01 71 19

SITE SAFETY PLAN

1.01 GENERAL

A. The Contractor shall comply with safety standards established within the CAL-OSHA CCR Construction Safety Orders (CSO), General Industry Safety Orders (GISO), and Electrical Safety Orders (ESO) that are applicable to the work. The Contractor shall have a complete copy of the CSO, GISO, and ESO at the work site.

B. The citation or listing of specific laws, ordinances, or regulations in this and other sections of the specifications is not a complete inventory of the laws, ordinances, or regulations that apply to those engaged or employed on the work, materials used in the work, the conduct of the work, or the safety and protection of persons, property, and the environment. These citations shall not limit or diminish the Contractor's responsibility to keep fully informed of and observe and comply with laws, regulations, ordinances, codes, orders, rules, standards, or decrees of public bodies having jurisdiction.

1.02 SUBMITTALS

A. Contractor shall submit a site-specific Injury and Illness Prevention Program (IIPP) for Engineer approval. IIPP shall be site specific and include all work items for both Contractors and Subcontractors onsite. A copy of the Contractor’s approved IIPP shall be kept onsite and available to the City’s representatives at all times.

B. Prior to commencing work onsite, Contractor shall submit the name of the Contractor’s safety and health representative who will be responsible for site safety and/or safety inspections as required by CCR Title 8, Construction Safety Orders.

C. Before excavating trenches or other excavations 5 feet and greater, Contractor shall submit in writing the Contractor’s designated "competent person" responsible for performing inspections of excavation areas for safety.

D. Contractor shall maintain (onsite) an up to date table of all Safety Data Sheets (SDS) for all known hazards onsite per CAL-OSHA regulations, Section 5194. SDS shall be in place prior to commencing work onsite.
1.03 **ACCIDENT REPORTING**

A. Contractor shall report all accidents or incidents that cause property damage or personal injury in writing to the Engineer no less than 24 hours after the incident.

END OF SECTION
SECTION 01 71 23

CONSTRUCTION SURVEYING

1.01 THE REQUIREMENT

A. Permanent Survey Markers:

1. The Contractor shall be responsible for all surveys required to layout the Work and for the accuracy of all survey work for construction. The Contractor shall include the cost of all such survey work in their Bid. The Contractor shall have all construction surveying performed by a `Licensed Land Surveyor' or a `Civil Engineer' registered by the State of California to perform such work. The Project Representative reserves the right to verify all survey work done by the Contractor.

2. The Contractor shall preserve the initial survey control points for the duration of their usefulness. Monumentation that is subject to disturbance or destruction in the trench line as shown on the Plans shall be located and referenced prior to construction and relocated and referenced if necessary after construction by the City.

3. The Contractor shall be responsible for the preservation of survey monuments and benchmarks as required by state law. Any lost or disturbed monuments shall be replaced at the Contractor's expense by a California Licensed Land Surveyor or Registered Civil Engineer authorized to practice land surveying. Where there are any monuments to be removed or damaged by the Contractor, the Contractor shall notify the City in writing seven (7) calendar days before starting the Work.

B. Survey Service:

The Contractor will perform and be responsible for the accuracy of surveying adequate for construction. If any construction survey stakes are lost or disturbed and need to be replaced, such replacement shall be by the Contractor at no additional expense to the City of Thousand Oaks.

C. Line and Grade:

1. The Contractor shall furnish all lines and grades required for proper execution of the work.

2. All work shall conform to the lines, elevations, and grades shown on the Plans.
3. Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected.

D. Construction Surveys:

1. Construction Surveys shall be compatible with the design survey.

2. The Contractor shall provide all reference stakes and form checks necessary for construction and inspection of improvements. All construction staking shall be documented in survey field notes. This staking may include but is not limited to: removals, joins, rough grade, slope, utilities, storm drains, sewers, curbs, walks, paving, wall and building stakes; and any other staking necessary for construction and inspection.

E. Reference or Grade Stakes:

A reference or grade stake shall be set for each grade change or angle point shown on the plan, standard plan, and shop drawing, in addition to the normal staking interval.

F. Staking Intervals and Offset Stake Lines:

All staking intervals shall be in accordance with the Caltrans Survey Manual. Stake lines shall be set at an offset distance from the improvement to ensure proper grade, station, and alignment.

G. Additional Survey Work:

The Contractor may be required to furnish additional survey work, such as profiles, restakes, Change Orders, etc., at the request of the City or the Project Representative.

H. Accuracy:

1. The Contractor shall use appropriate surveying methods to obtain the following standards: For fixed works (i.e. cast-in-place concrete; asphalt pavement, pipes and drains; and other items determined by the City) the following survey standards shall be used. The absolute horizontal accuracy, in relationship to the control, shall be such that the semi major axis of its 95% error ellipse is ±0.015 foot or less. The absolute vertical accuracy, in relationship to the control, shall be such that its standard deviation is ±0.015 foot or less. The relative horizontal accuracy of survey points within the Project shall be such that the semi major axis of its 95% error ellipse is ±0.015 foot or less. The relative vertical accuracy of survey points within the Project shall be such that its standard deviation is ±0.015 foot or less.
2. For excavation purposes, the following survey standards shall be used. The absolute horizontal accuracy, in relationship to the City’s control, shall be such that the semi major axis of its 95% error ellipse is ±0.1 foot or less. The absolute vertical accuracy, in relationship to the City’s control, shall be such that its standard deviation is ±0.1 foot or less. The relative horizontal accuracy of survey points within the Project shall be such that semi major axis of the 95% error ellipse is ±0.1 foot or less. The relative vertical accuracy of survey points within the Project shall be such that its standard deviation is ±0.1 foot or less.

I. Survey/Inspector:

The Contractor shall provide to the City those measurements and control points necessary to determine the location and conformance to the plan, line, and grade of the improvements necessary for inspection purposes and necessary for the expedient completion of the Project.

J. Survey Notes:

The Contractor shall supply and keep notes on City of Thousand Oaks standard format note sheets. The City may request copies of, and otherwise review, survey notes at any time during the construction phase of the Project. Upon completion of the Project, the original survey notes shall become the property of the City of Thousand Oaks and shall be delivered to the City.

END OF SECTION
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1.01 GENERAL

A. The Contractor shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation, all in accordance with requirements of the Contract Documents.

B. The Contractor shall verify the exact locations and depths of all utilities shown and the Contractor shall make exploratory excavations of all utilities that may interfere with the Work. All such exploratory excavations shall be performed as soon as practicable after award of contract and, in any event, in sufficient time in advance of construction to avoid possible delays to the Contractor's work. When such exploratory excavations show the utility location as shown to be in error, the Contractor shall so notify the Engineer.

C. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the utilities.

1.02 RIGHTS-OF-WAY

The Contractor shall not do any work that would affect any oil, gas, sewer, or water pipeline; any telephone, telegraph, or electric transmission line; any fence; or any other structure, nor shall the Contractor enter upon the rights-of-way involved until notified by the Engineer that the City has secured authority therefor from the proper party. After authority has been obtained, the Contractor shall give said party due notice of its intention to begin work, and shall give said party convenient access and every facility for removing, shoring, supporting, or otherwise protecting such pipeline, transmission line, ditch, fence, or structure, and for replacing same. When two or more contracts are being executed at one time on the same or adjacent land in such manner that work on one contract may interfere with that of another, the City shall determine the sequence and order of the Work. When the territory of one contract is the necessary or convenient means of access for the execution of another contract, such privilege of access or any other reasonable privilege may be granted by the City to the Contractor so desiring, to the extent, amount, in the manner, and at the times permitted. No such decisions as to the method or time of conducting the Work or the use of territory shall be made on the basis of any claim for delay or damage, except as provided for temporary suspension of the Work in Article 15 of the General Conditions of the Contract.
1.03 PROTECTION OF SURVEY MONUMENTS OR MARKERS

The Contractor shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced for easy and accurate restoration. It shall be the Contractor's responsibility to notify the proper representatives of the City of the time and location that work will be done. Such notification shall be sufficiently in advance of construction so that there will be no delay due to waiting for survey points to be satisfactorily referenced for restoration. All survey markers or points disturbed by the Contractor without proper authorization by the Engineer, will be accurately restored by the City at the Contractor's expense after all street or roadway resurfacing has been completed. Contractor to refer to Specification 01 71 23 for additional information on survey monument preservation.

1.04 RESTORATION OF PAVEMENT

A. General: All paved areas, including asphaltic concrete berms cut or damaged during construction, shall be replaced with similar materials and of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. All temporary and permanent pavement shall conform to the requirements of the affected pavement owner. All pavements that are subject to partial removal shall be neatly saw-cut in straight lines.

B. Temporary Resurfacing: Wherever required by the public authorities having jurisdiction, the Contractor shall place temporary surfacing promptly after backfilling, and shall maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of improvements.

C. Permanent Resurfacing: In order to obtain a satisfactory junction with adjacent surfaces, the Contractor shall saw-cut back and trim the edge so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight lines. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.

D. Restoration of Sidewalks or Private Driveways: Wherever sidewalks or private roads have been removed for purposes of construction, the Contractor shall place suitable temporary sidewalks or roadways promptly after backfilling, and shall maintain them in satisfactory condition for the period of time fixed by the authorities having jurisdiction over the affected portions before proceeding with
the final restoration or, if no such period of time is so fixed, the Contractor shall maintain said temporary sidewalks or roadways until the final restoration thereof has been made.

1.05 RESTORATION OF LANDSCAPE AND HARDSCAPE

A. **General:** All landscape and hardscape paved areas cut or damaged during construction, shall be replaced with similar materials and of equal quality and thickness to match the existing adjacent undisturbed areas, except where other specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. All temporary and permanent landscape and hardscape shall conform to the requirements of the affected pavement owner. All pavements that are subject to partial removal shall be neatly saw-cut in straight lines.

B. **Restoration of Turf:** All turf and landscaped areas, cut, removed, or damaged during construction, shall be replaced with similar plants or turf and of equal type to match the existing adjacent undisturbed landscaped areas within the project’s temporary construction easements, except where specific landscape requirements have been called for in the Contract Documents or in the requirements of the Agency issuing the permit.

C. **Temporary Landscaping:** Wherever required by the City, the Contractor shall place temporary landscaping promptly after backfilling, and shall maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of landscape and hardscape improvements.

D. **Permanent Resurfacing:** The Contractor shall install the permanent landscape and hardscape replacement for all affected areas within 15 calendar days of the initial removal. All restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.

1.06 EXISTING UTILITIES AND IMPROVEMENTS

A. **General:** The Contractor shall protect all Underground Utilities and other improvements that may be impaired during construction operations. It shall be the Contractor’s responsibility to ascertain the actual location of all existing utilities and other improvements that will be encountered in its construction operations, and to see that such utilities or other improvements are adequately protected from damage due to such operations. The Contractor shall take all possible precautions for the protection of unforeseen utility lines to provide for uninterrupted service and to provide such special protection as may be necessary.

B. **Utilities to be Moved:** In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder, upon
request of the Contractor, will be notified by the City to move such property within a specified reasonable time. When utility lines that are to be removed are encountered within the area of operations, the Contractor shall notify the Engineer in sufficient time in advance for the necessary measures to be taken to prevent interruption of service.

C. Where the proper completion of the Work requires the temporary or permanent removal and/or relocation of an existing utility or other improvement that is shown, the Contractor shall remove and, without unnecessary delay, temporarily replace or relocate such utility or the facility. In all cases of such temporary removal or relocation, restoration to former location shall be accomplished by the Contractor in a manner that will restore or replace the utility or improvement as nearly as possible to its former location and to as good or better condition than found prior to removal.

D. City's Right of Access: The right is reserved to the City and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the Work of this Contract.

E. Underground Utilities Shown or Indicated: Existing utility lines that are shown or the locations of which are made known to the Contractor prior to excavation and that are to be retained and all utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired by the Contractor.

F. Underground Utilities Not Shown or Indicated: In the event that the Contractor damages any existing utility lines that are not shown or the locations of which are not made known to the Contractor prior to excavation, a written report thereof shall be made immediately to the Engineer. If directed by the Engineer, repairs shall be made by the Contractor under the provisions for changes and extra work contained in Article 43 of the General Conditions.

G. All costs of locating, repairing damage not due to failure of the Contractor to exercise reasonable care, and removing or relocating such utility facilities not shown in the Contract Documents with reasonable accuracy, and for equipment on the project which was actually working on that portion of the work which was interrupted or idled by removal or relocation of such utility facilities, and which was necessarily idled during such work will be paid for as extra work in accordance with the provisions of Article 43 of the General Conditions.

H. Approval of Repairs: All repairs to a damaged improvement are subject to inspection and approval by an authorized representative of the improvement owner before being concealed by backfill or other work.
I. Maintaining in Service: All oil and gasoline pipelines, power, and telephone or other communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of the Work shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the Engineer are made with the owner of said pipelines, duct, main, irrigation line, sewer, storm drain, pole, wire or cable. The Contractor shall be responsible for and shall repair all damage due to its operations, and the provisions of this Section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

1.07 TREES WITHIN STREET RIGHTS-OF-WAY AND PROJECT LIMITS

A. General: The Contractor shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs, including those lying within street rights-of-way and project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the City or other jurisdictional agency.

This includes any work under the Protected Zone or Dripline of all Oak or Landmark Trees, including hand digging and notifications. During excavation for trenching, if any oak or landmark tree root over 2” in diameter is encountered, Contractor will stop digging and notify the City to have the arborist/oak tree consultant conduct a field inspection to determine if it is appropriate to cut the root(s) or whether the improvements need to be redesigned to avoid critical root damage to ensure perseveration of the tree.

All existing trees and shrubs which are damaged during construction shall be trimmed or replaced by the Contractor or a certified tree company under permit from the City or other jurisdictional agency and to the satisfaction of said City and/or agency. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs.

B. Trimming: The natural shape and form of the tree shall be preserved and enhanced; no stubs or splits or torn branches left; no topping or drop crotching; and clean cuts shall be made close to the trunk or large branches.

C. Replacement: The Contractor shall immediately notify the City and/or other jurisdictional agency if any tree is damaged by the Contractor's operations. If, in the opinion of the City or said other agency, the damage is such that replacement is necessary, the Contractor shall replace the tree at its own expense. The tree shall be of a like size and variety as the tree damaged or, if of a smaller size, the Contractor shall pay to the owner of said tree a compensatory payment acceptable to the tree owner, subject to the approval of the City or other jurisdictional agency. The size of the trees shall be not less
than 25 mm (1-inch) diameter or less than 1.8 meters (6 feet) in height. Fines will be assessed against the Contractor for trees removed without the City's prior written approval. The minimum amount of fine or restitution to the City will be the replacement of the tree removed, with one of equal or greater size and maturity and as approved by the City. Larger fines may be assessed against the Contractor depending upon the circumstances and type of tree removed, especially in the case of oak trees.

1.08 NOTIFICATION BY THE CONTRACTOR

Prior to any excavation in the vicinity of any existing underground facilities, including all water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and street lighting facilities; and all roadway and state highway rights-of-way, the Contractor shall notify the Underground Service Alert agency, and the respective authorities representing the owners or agencies responsible for such underground facilities, not less than two days or more than six days prior to excavation so that a representative of said owners or agencies can be present during such work if they so desire. Underground Service Alert may be reached by calling 811.
SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.01 GENERAL

The contractor shall follow the requirements and procedures for ensuring optimal diversion of construction waste materials generated by the Work from landfill disposal within the limits of the Construction Schedule and Contract Sum.

A. Contractor shall comply with City Ordinance No. 1639-NS for regulations on Construction and Demolition (C&D) Waste Management. The C&D Waste Management Plan must include estimated weights of the materials, list of proposed recycling/disposal facilities, and authorized hauling companies to be used (or self-hauling by the Contractor). The Contractor can visit www.toaks.org/GoGreen for a list of authorized waste haulers, and visit www.thousandoaks.wastetracking.com to submit the C&D Waste Management Plan.

B. The Work of this Contract requires that a minimum percentage of the construction and demolition waste materials generated (by weight) in the Work be diverted from landfill disposal through a combination of re-use and recycling activities by diversion to recycling centers. This diversion percentage must meet or exceed the most current CalGreen and City of Thousand Oaks Municipal Code requirements, as listed in Item 1.04A herein.

C. Contractor shall submit their C&D Waste Management Plan prior to the issuance of encroachment, building, grading, or paving permits, and prior to commencement of the Work.

D. Copies of weight receipts from disposal/recycling facilities, including certified weights for all recycled, reused or diverted materials, shall be submitted continuously during the project, and also accompany the final Construction and Demolition (C&D) Recycling Report by the Contractor.

E. The Final C&D Recycling Report must be submitted upon completion of the project before the contract retention money can be released. "Completion" means the earliest of the following dates: the date a certificate of occupancy is issued by the City for a covered project, the completion date of a covered project per final City inspection and approval, or, if no final approval is required, 30 calendar days following the date the work authorized by the permit(s) is completed, as determined by the Project Manager. The Final C&D Recycling
Report, and accompanying weight receipts/tickets, shall be submitted online at www.thousandoaks.wastetracking.com.

1.02 SUMMARY

A. Work Included: This Section includes administrative and procedural requirements for the following:

1. Recycling non-hazardous demolition and construction waste.

2. Disposing of non-hazardous demolition and construction waste.

1.03 DEFINITIONS

A. Authorized Hauler: A City of Thousand Oaks permitted franchise C&D waste hauler providing dumpster or roll-off box service to collect and transport C&D debris, a list of approved waste haulers can be found at www.toaks.org/GoGreen. It is noted that self-hauling by the Contractor is also allowable.

B. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

C. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

D. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

E. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

F. Salvage: The controlled removal of construction or demolition debris from a permitted building or demolition site for the purpose of recycling, or reuse.

G. Self Hauling: Contractor self-performing all collection and hauling of C&D materials from the jobsite to the recycling and disposal facilities.

1.04 PERFORMANCE REQUIREMENTS:

A. General: Develop C&D waste management plan that results in end-of-Project rates for salvage/recycling that meet the requirements of the most current CalGreen and City of Thousand Oaks Municipal Code (currently 65 percent by weight as of January 1, 2018) of the total waste generated by the Work.
B. Recycle Requirements: Owner’s goal is to recycle all nonhazardous demolition and construction waste. Owner has established minimum goals for the following materials:

1. Demolition Waste:
   a. Asphaltic concrete paving
   b. Concrete
   c. Concrete reinforcing steel

2. Construction Waste:
   a. Site-clearing waste.
   b. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
      1) Paper, Cardboard and Boxes
      2) Plastic sheet and film
      3) Polystyrene packaging
      4) Plastic pails

1.05 SUBMITTALS

A. Submittal Procedures: Refer to Sections 01 32 19.

B. C&D Waste Management Plan: Submit the Plan online at www.thousandoaks.wastetracking.com within 30 days of date established for the Notice of Award.

C. Contractor shall list/include the City Project Manager as an additional listed Project Manager on the online Waste Management Plan tracking system.

D. The Final C&D Recycling Report must be submitted upon completion of the project before the contract retention money can be released. "Completion" means the earliest of the following dates: the date a certificate of occupancy is issued by the City for a covered project, the completion date of a covered project per final City inspection and approval, or, if no final approval is required, 30 calendar days following the date the work authorized by the permit(s) is completed, as determined by the Project Manager. The Final C&D Recycling Report, and accompanying weight receipts/tickets, shall be submitted online at www.thousandoaks.wastetracking.com.

E. Recycling and Processing Facility Records: Copies of weight receipts from disposal/recycling facilities, including certified weights for all recycled, reused, or
diverted materials, shall be submitted continuously during the project, and also accompany the final Construction and Demolition (C&D) Recycling Report by the Contractor. Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices. The Final C&D Recycling Report, and accompanying weight receipts/tickets, shall be submitted online at www.thousandoaks.wastetracking.com.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of recyclable landfills and incinerator facilities licensed to accept them.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Review methods and procedures related to waste management including, but not limited to, the following:

C. Review and discuss C&D waste management plan, including responsibilities of Waste Management Coordinator.

D. Review requirements for documenting quantities of each type of waste and its disposition.

E. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid the delays.

F. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.

G. Review waste management requirements for each trade.

1.07 C&D WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction and work plan. Indicate quantities by weight or volume but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
C. Waste Reduction Work Plan:

1. General: List each type of waste and whether it will be recycled, reused, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations.

3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations.

4. Recycled Materials: Applicant to select from a list of facilities through the online portal, based on the materials entered.

5. Disposed Materials: Applicant to select from a list of facilities through the online portal, based on the materials entered.

6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Delivery Receipts: Maintain copies of delivery receipts for waste materials salvaged and sent to permit waste materials processors or recyclers that indicate the location and name of firm accepting recyclable waste materials, types of materials, net weights of each type, date of delivery and value of materials. All receipt information will be kept in a Construction Waste Management Haul Log.

E. Forms: Prepare and submit the C&D waste management plan online at www.thousandoaks.wastetracking.com.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PLAN IMPLEMENTATION

A. General: Implement C&D waste management plan as approved by the City. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
B. Waste Management Coordinator: Engage or designate a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site as required for duration of Project.

C. Training:

1. Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

2. Distribute waste management plan to everyone concerned within 3 days of submittal return.

3. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls:

1. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

2. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

3. Control dust and dirt, and provide environmental protection and noise control.

3.02 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper, plastics, and beverage containers used by on-site workers.

B. Recycling Receivers and Processors: Available recycling receivers and processors for concrete, asphalt, dirt and other waste include, but not limited to, the following on the following list: https://dpw.lacounty.gov/epd/swims/OnlineServices/search-solid-waste-sites-esri.aspx

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
2. Inspect containers and bins for contamination and remove contaminated materials if found.

3. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

4. Stockpile materials away from construction area. Do not store within drip line of remaining trees.

5. Store components off the ground and protect from the weather.

6. Remove recyclable waste off Owner’s property and transport to recycling receiver or processor.

3.03 DISPOSAL OF WASTE:

A. General:

1. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

2. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.

3. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Burning of waste materials is not permitted.

C. Disposal: Transport waste materials and dispose of at designated spoil areas on Owner’s property or transport waste materials off Owner’s property and legally dispose of them at a facility licensed to accept them.

END OF SECTION
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1.01 SCOPE OF WORK

A. Equipment testing and facility startup are requisite to satisfactory completion of the Contract and, therefore, shall be completed within the contract time. Except where otherwise provided, all work specified in this Section shall be performed at no additional cost to the City.

B. Commission all systems and equipment to verify performance, function, and correct operation. Complete all work necessary to activate, adjust, test, startup, and demonstrate that the Work, including but not limited to all systems, components, and equipment, is in operating order in accordance with the general requirements of this Section and the detailed requirements of the technical sections under the system or equipment specified.

C. To ensure that the Work is ready for full-time operation, the procedures shall include verification, balancing, calibration, witness testing, documentation, inspection by equipment manufacturers, operator training where specified, and other procedures as specified or necessary for each component and system as a whole unit, as applicable.

D. The systems that shall be commissioned and started up as a whole unit include the following:

1. System 1: Pump P1 using SCE power supply and associated piping, electrical switchgear, motor control center, controls, instruments, air compressor, PLC, and SCADA system.

2. System 2: Pump P2 using SCE power supply and associated piping, electrical switchgear, motor control center, controls, instruments, air compressor, PLC, and SCADA system.

3. System 3: Pumps P1 and P2 simultaneously using SCE power supply and associated piping, electrical switchgear, motor control center, controls, instruments, air compressor, PLC, and SCADA system.

4. System 4: Fire Pump P3 using SCE power supply and associated piping, electrical switchgear, motor control center, controls, instruments, air compressor, PLC, and SCADA system.
5. System 5: Fire Pump P3 using diesel generator and associated piping, electrical switchgear, motor control center, controls, instruments, air compressor, PLC, and SCADA system.


E. Control Panel and SCADA

1. Testing and commission of the control panel shall include point-to-point testing of all control loops, and each control and instrumentation component. The Site point-to-point testing of the complete control system shall include checkout from the internal registers and program points of the control panel to each field component and control panel device to ensure that each portion of the completed system operates as intended.

2. For a complete and additional SCADA testing, refer to Section 17 50 00.

F. Notification: Notify the City at least 5 Working Days before City-witnessed field tests and/or total system operation, as applicable, are to occur so that the Owner can coordinate and make other arrangements for full-time operation.

G. Coordination: During the startup period, coordinate the operation of the equipment with Engineer, subcontractors, City, and manufacturer's representatives.

H. Furnish all test equipment, measuring devices, and supplies required to conduct tests.

I. Maintain the equipment until final acceptance by the City. Provide all lubricants and power necessary until acceptance by the City.

J. Furnish all expendable supplies required for startup, demonstration, and testing and dispose of all waste or used supplies, water, etc., in a manner acceptable to the City and any applicable regulatory agency(ies).

K. Perform additional startup tasks and field tests as specifically required by Specification Sections for individual equipment.

L. After successful completion of startup tests, replenish all consumed supplies, including diesel.

1.02 SUBMITTALS

A. Startup Plan, Forms, and Schedules: At least three months prior to facility startup, prepare and submit a facility startup plan and schedule for each major
component and system and one overall startup plan and schedule. The plans shall include test methods and procedures and sample forms for recording test data for each component and system test.

B. Documentation of tests, balancing reports, affidavits, and the like.

C. Signed and dated Calibration Test Reports for each instrumentation component and signed and dated Loop Status Reports for each instrumentation and control loop.

1.03 INITIAL STARTUP AND OPERATION OF FACILITIES

A. The following listing is a general sequence of startup activity steps to be used in placing facility systems into operation.

1. Perform initial lubrication of equipment and have manufacturers check and adjust equipment. Provide all subsequent lubrication and maintenance, and such staff as required for test operation. Complete leakage and disinfections tests of all piping and valves.

2. Perform satisfactory testing of electrical work required prior to energizing of the electrical and control systems.

3. After completion of Step 2, perform satisfactory electrical testing required after energizing of the electrical system.

4. Complete calibration of instruments and verification of control loops and complete all calibration documentation.

5. Satisfactorily complete system verification of instrumentation work, including Point-to-Point checkouts.

6. After completion of Steps 1 through 3, perform a rotational test of equipment and correct backward rotating drives.

7. After completion of Steps 5 and 6, test operate the equipment by manually initiating the operations. Where manual operation bypasses alarm or safety monitoring, provide continuous supervision of such parameters.

8. Concurrent with Step 7, perform any necessary final instrumentation and control testing and adjustments as related to the equipment being tested.

9. Concurrent with Step 7 and where possible at this stage of startup, complete the performance testing specified for the equipment.
10. Concurrent with Step 7, perform adjustments of the electrical work and systems as related to the equipment being tested. Document any changes made to transformer tap settings, circuit breaker trip adjustments, overload compensation changes, time-delay adjustments, or similar changes, and submit report of changes to the Engineer.

11. Repeat Steps 1 through 10 as required for all equipment items and systems until all process components and utility systems are ready for total operation.

1.04 FINAL FUNCTIONAL TESTS

A. Upon completion of all of the steps specified in Paragraph 1.03, the final functional tests shall be performed for each major component and system. The systems that shall be commissioned, started up and operated individually as a whole unit includes the following:

1. **System 1:** Pump P1 using SCE power supply and associated piping, electrical switchgear, motor control center, controls, instruments, air compressor, PLC, and SCADA system. This system shall be operated for continuous 3 hours minimum.

2. **System 2:** Pump P2 using SCE power supply and associated piping, electrical switchgear, motor control center, controls, instruments, air compressor, PLC, and SCADA system. This system shall be operated for continuous 3 hours minimum.

3. **System 3:** Pumps P1 and P2 simultaneously using SCE power supply and associated piping, electrical switchgear, motor control center, controls, instruments, air compressor, PLC, and SCADA system. This system shall be operated for continuous 2 hours minimum.

4. **System 4:** Fire Pump P3 using SCE power supply and associated piping, electrical switchgear, motor control center, controls, instruments, air compressor, PLC, and SCADA system. This system shall be operated for continuous 2 hours minimum.

5. **System 5:** Fire Pump P3 using diesel generator and associated piping, electrical switchgear, motor control center, controls, instruments, air compressor, PLC, and SCADA system. This system shall be operated for continuous 1.5 hours minimum.

6. **System 6:** Diesel generator using external load bank and associated components. This system shall be operated for continuous 2.0 hours minimum.
B. It may not be feasible to perform final functional test for more than one system per day. The Contractor shall consider one working day for testing each system specified in 1.04.A. It may not be feasible to perform final functional tests on consecutive days. The Contractor shall consider minimum ten (10) working days for testing all six systems specified in 1.04.A.

C. The City will provide operating water.

D. Monitor and record all pertinent data that are required to establish proper operation of the components and each system that is being operated. Refer to applicable technical sections and requirements of the component manufacturers for testing and start-up requirements. The following data shall be monitored and recorded, as applicable, but not limited to:

1. Pump station upstream water pressure
2. Pump station downstream water pressure
3. Water flow
4. Electrical voltage
5. Electrical current
6. KWH
7. KW
8. Ambient temperature
9. Soft starter operation during ramping up and closing
10. Pump control valve operation during starting and stopping pump
11. Vibration
12. Noise
13. Surge tank pressure before starting pump, during pump start-up, during pump shutdown, and after complete pump shutdown.
14. Air compressor operation on or off (compressor shall be off during pump system operation).
15. Alarms and signals
16. Communication with facility PLC
17. Communication with City’s Supervisory Control Center (by City’s Representative)

E. The Contractor shall have appropriate staff available to adjust, repair and correct deficiencies as required to keep the facilities in continuous operation for the period specified in Paragraph 1.04.A. Representatives of manufacturers of critical equipment shall also be present for the specified final test period as needed or as required elsewhere in these Specifications. The Contractor shall also furnish all such mechanical and electrical workers as required to make adjustments to and perform all required maintenance for the operating equipment until the end of the final functional test period. Maintenance of operating equipment shall include lubrication, adjustments, replacements, and modifications as required.
F. If operation of any system is interrupted for a period of 10% of the test period or more due to a failure of any equipment or work provided by the Contractor, then the functional test shall be repeated for the entire period specified in 1.04.A.

G. After successful completion of all functional tests, the City will take over maintenance duties as well as operation.

H. Following the commencement of the Final Functional Test, satisfactorily complete equipment performance testing, electrical testing and adjustments, and instrumentation/control testing and adjustments, to the extent that such testing and adjustments could not be made prior to full facility operation.

I. Complete the documentation/reports of tests, start-up, balancing reports, calibration reports, and the like for submittal to the Engineer. Include all field monitoring records along with the documentation/reports.

1.05 SPECIAL REQUIREMENTS

A. The Contractor shall make sure that when Pump P1 and/or Pump P2 are operating, Pump P3 is locked out and turned off. Refer to Loop Descriptions, P&ID diagrams and other applicable technical sections for information and additional requirements.

B. The Contractor shall make sure that when Pump P3 (Fire Pump) is operating, Pump P1 and Pump P2 at La Granada Pump Station and existing pumps at Lone Oak Pump Station for the Wilder Zone (the same zone La Granada Pump Station is pumping to) are locked out and turned off. Refer to Loop Descriptions, P&ID diagrams and other applicable technical sections for information and additional requirements.

C. Coordinate with City staff to ensure that the requirements specified above in Paragraph 1.05.A and 1.05.B are met prior to testing respective pump(s).

D. Coordinate with City staff to ensure that water levels in the existing Wilder Reservoir and La Granada Reservoir are at suitable elevations for testing La Granada Pumps.

END OF SECTION
SECTION 01 77 00
PROJECT CLOSEOUT

1.01 FINAL CLEANUP

The Contractor shall promptly remove from the vicinity of the completed Work, all rubbish, debris, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. The Notice of Completion will be withheld until the Contractor has satisfactorily completed the final cleanup of the project site and laydown area.

1.02 CLOSEOUT TIMETABLE

A. The Contractor shall establish dates for equipment testing, facility startup, and acceptance periods (as required under the Contract) and shall include them in the overall project CPM schedule. Such dates shall be established not less than one week prior to beginning any of the foregoing items to allow the City, the Engineer, and their authorized representatives and consultants sufficient time to schedule attendance at such activities.

B. All temporary buildings, including field offices, storage buildings, and sheds shall be removed from the project site seven days after completion of the Work as defined in the Contract Documents. All temporary services such as water, power, utilities, service contracts, pager contracts, telephones, and other temporary services shall remain in service until execution of a Notice of Completion of the Work by the City, and shall be discontinued within 7 days after said Notice of Completion of the Work.

C. Contractor-furnished Internet Access, Wi-Fi, copy machines, computers and printers, and other Contractor-furnished office equipment shall remain in service at the City's project field office until the execution of a Notice of Completion of the Work, as defined in the Contract Documents. The Contractor shall then remove all such items from the project site within 7 days following the issuance of Notice of Completion of the Work.

1.03 TECHNICAL MANUAL (OPERATION AND MAINTENANCE MANUAL) SUBMITTALS

The Contractor's attention is directed to the condition that one half of one percent of the contract price will be deducted from any monies due the Contractor as progress payments if, at the 75 percent construction completion point, the approved technical manuals have not been submitted in accordance with Section entitled "Contractor Submittals." The aforementioned amount will be retained by the City as the agreed, estimated value of the approved technical manuals. Any
such retention of money for failure to submit the approved technical manuals on or before the 75 percent construction completion point shall be in addition to the retention of any payments due to the Contractor as specified in the General Conditions.

1.04 DOCUMENTS REQUIRED PRIOR TO NOTICE OF COMPLETION

A. The Contractor, prior to the City’s issuance of the Notice of Completion, shall submit the following items to the Resident Project Representative for transmittal to the City Engineer:

1. Written guarantees or warranties.

2. Technical and/or Operation and Maintenance manuals and instructions with test results included.


4. Maintenance stock items, spare parts, special tools.

5. Certificates of inspection and acceptance by other local governing agencies having jurisdiction.

6. Final Construction and Demolition Recycling Report, including copies of weight receipts from disposal/recycling facilities, including certified weights for all recycled, reused, or diverted materials.

7. Final approved copy of the clearly marked redline field copy of as-built record drawings, incorporating all field changes and modifications from the original design drawings.

8. Releases executed by property owners adjacent to the project site or property owners for any staging or laydown areas attesting that the Contractor has restored any damage done to their property during construction.

9. Releases from all parties who are entitled to claims against the subject project, property, or improvement or have submitted stop notices pursuant to the provisions of law.

10. Post Construction photo and videos, as specified in the Section titled “Contractor Submittals.”

11. Proper completion & closeout of all Submittals as referenced in Section titled 01 32 19 “Submittals.”
12. Handover of all required concrete/slurry delivery tickets and any required reinforcement mill certificates.

13. Final cleanup of the project site and laydown area as deemed acceptable by the City.

14. Acceptance and completion of all Punch List Items in their entirety. The Contractor shall schedule shall incorporate sufficient time at the end for final closeout and completion of punch list, as part of the base duration within the specified overall duration of the project.

15. The final As-Built Schedule recording the completion of work activities shall be provided by the Contractor upon completion of Contract work per specification 01 32 13 “CPM Schedule.”

16. Replacement of any lost or disturbed monuments per section 01 71 23.

17. Satisfactory submission of final progress payment.

1.05 COMPLETION OF THE WORK

A. Completion of the Work, as the term is used in this Contract shall mean full completion of the Work as defined by the contract documents and as described in the section above.

B. The date of completion of the Project shall be the date when the construction and all bid items are fully completed, in accordance with the Contract Documents, as modified by any change orders agreed to by the parties, so that the City can occupy or utilize the project for the use for which it was intended, and the City has accepted the Project as evidenced by recording of a Notice of Completion.

1.06 CORRECTION AND REPAIR

A. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the Contractor which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the Contractor shall have obtained a statement in writing from the affected private owner or public agency releasing the City from further responsibility and liability in connection with such repair or resurfacing.

B. The Contractor shall make all repairs and replacements promptly upon receipt of written order from the City. If the Contractor fails to make such repairs or replacements promptly, the City reserves the right to do the work or to have the work done by others and the Contractor and its Surety shall be liable to the City for the cost thereof.
1.07 MAINTENANCE OF PROJECT RECORDS & INSURANCE

The Contractor shall maintain all project records, photograph and other items as required Article 27 and 32 of the General Conditions, and also maintain the project insurance beyond the Notice of Completion as required in Article 37 of the General Conditions.

1.08 RELEASE OF RETENTION

The Contractor, after the Notice of Completion and prior to requesting its retention payment, shall complete or submit the following items to the Resident Project Representative for transmittal to the City Engineer:

A. Removal of Project Signs.

B. All Conditional & Unconditional Payment Waivers/Release delivered.

C. Removal of Field Offices & any Temporary Utilities/Services Associated with the Field Office.

D. Removal of Any Required Portable Changeable Message Signs as Required by Traffic Control Plan.

E. Clearing of any stop notices that were issued after the filing of the NOC.

END OF SECTION
SECTION 02 01 00
EXISTING UTILITIES MARKING AND POTHOLING

1.01 STATUTORY REQUIREMENTS
A. The work of this Section shall comply with current versions, with revisions, of the following:
   1. Construction Safety Orders, Division of Industrial Safety, State of California
   2. California Division of Occupational Safety and Health (Cal-OSHA)
   3. California Code of Regulations (CCR)
   4. Underground Service Alert ("DigAlert") Laws

1.02 SCOPE OF WORK
A. Furnish all labor, materials, equipment and incidentals required to mark and pothole existing utilities based on the drawings, as specified herein, and as required to complete the work.
B. Submit pothole reports for Engineer’s Review.
C. Revise shop drawings of affected new facilities and materials, including pipeline, conduits, and belowground structures.
D. Coordinate with DigAlert, utility companies, and owners of underground facilities.

1.03 SUBMITTAL
A. Submit pothole reports with sufficient data and details of existing utilities, including location, top and bottom elevations, depth, slope.
B. Submit proposed revised alignment and revised shop drawings of pipelines, drains, conduits and like items based on the accepted pothole reports. These shop drawings shall be submitted under the respective technical Section of the item.

1.04 NOTIFICATION
A. At least 48 hours prior to commencement of operation, notify the City of the proposed schedule, therefore.
B. Utility owners shall be given at least 7 days' written notice prior to commencing potholing. If a utility owner is not able or equipped to locate its utility, the Contractor shall locate at no additional cost to the City.

C. Notify Underground Service Alert (“DigAlert”) in accordance with the applicable laws.

1.05 INFORMATION ON DRAWINGS AND SUBSURFACE CONDITION

A. Available records have been reviewed to determine the approximate location of underground lines and utilities at the construction site(s). This information is presented on the Drawings. The information provided is only for the convenience of the Bidders and the Contractor and the information and data provided is not implied or warranted to represent actual and/or present-day conditions. The Contractor shall accommodate actual existing field conditions on pipe Shop Drawings and other applicable submittals and shall be responsible for constructing facilities in place which conform to the intent of the design as shown on the Drawings.

B. All conclusions and deductions derived from said information shall be those of the Bidders or the Contractor. The Bidders and the Contractor are solely responsible for determining the existing subsurface conditions and making any necessary changes or revisions to accommodate the actual field conditions, and all conclusions and deductions shall be considered in the Bid. It shall be the responsibility of the Contractor to ascertain the exact locations of all subsurface facilities shown on the Drawings and all existing service laterals or appurtenance whose presence can be inferred from the presence of other visible facilities. Where underground main distribution conduits, such as water, gas, sewer, electric, telephone, or cable television, are shown on the Drawings, the Contractor shall assume that every parcel will be served by a service lateral connection for each type of utility, and no Extra Work may be claimed because of any such unknown subsurface facilities encountered at the construction site(s).

1.06 COMPLY WITH UNDERGROUND SERVICE ALERT LAWS

A. The Contractor shall comply with all Underground Service Alert (“DigAlert”) laws. As provided in Section 4216.2 of the California Government Code, at least two (2) Working Days but not more than fourteen (14) Working Calendar Days before beginning any excavation, the Contractor shall contact the Regional Notification Center (Underground Service Alert of Southern California at 811; the Contractor shall verify the phone number for any required notifications) and obtain an inquiry identification number.

B. The Contractor shall ensure that at least two (2) Working Days prior to potholing and the start of work, the electric, gas, telephone and other utility companies have been contacted and requested to mark out their underground utilities. This request shall be made by the Contractor prior to all trenching and excavation operations regardless of whether the Drawings show underground electric, gas, telephone and other utility ducts, cables or pipelines. In accordance with the provisions of the California
Government Code, the DigAlert inquiry identification number shall remain valid for not more than twenty-eight (28) Calendar Days from the date of issuance, and after that date shall require regional notification center revalidation; the Contractor shall be required to re-notify DigAlert if the identification number becomes invalid for any previous notifications.
1.07 UTILITY MARKING

The Contractor shall clearly paint, or cause to be painted through the Underground Service Alert process, the locations of all affected underground utilities on the pavement or identify the location with suitable markers if not on pavement. In addition to the locations of metallic pipes and conduits, non-metallic pipes, ducts and conduits, if present, shall also be similarly located using surface indicators and detection tape and shall then be similarly marked.

1.08 POTHOLING

A. After the utility notification and marking are completed, the Contractor shall commence “potholing” to determine the actual location and elevation of all underground utilities, piping, conduit, service laterals, structures and facilities where crossings, interferences, or connections to the new pipelines or other facilities (the Work) are shown in the Contract Documents, marked by the utility companies, or indicated by surface signs or other surface markers or indications, including, but not limited to, visible facilities such as manholes, meter boxes, junction boxes, pull boxes, curb markings, valves, valve boxes, cabinets, walls, visible utility trenches, power lines or conduits, or the like.

B. If a utility that is required to be potholed as described above is not found at the expected depth, the Contractor must continue to pothole deeper until either the utility is located or the pothole reaches one (1) foot below the elevation of the bottom of the planned pipeline or structure without encountering the utility.

C. The Contractor shall also “pothole” all utilities and structures parallel to and within (eight) 8 feet of the pipeline being constructed and within (four) 4 feet of any structure being constructed. Parallel utilities shall be potholed at sufficient intervals to verify the location of the utility relative to the pipeline or structure being constructed. If the Contractor should fail to pothole a parallel utility at an interval sufficient to verify the location of the utility relative to the pipeline or structure being constructed before submitting pipe Shop Drawings or beginning construction other than potholing as required, the Contractor shall not be entitled to any Extra Work due to any interference the parallel utility may pose, and the Contractor shall be liable for any and all necessary revisions to the facility being constructed or for relocating the parallel utility, as applicable, due to the location of the parallel utility.

D. Where the precise alignment, bearing, grade or slope of an existing utility is of concern, as in cases where precise compound bends or other fittings are required for connections to existing pipelines, the Contractor shall pothole a sufficient distance on each side of the area of concern (such as the connection point) to accurately determine the exact alignment, bearing, slope and grade of the existing facility.

E. The Contractor shall locate and uncover existing utilities to one foot below the
existing utility, including points of connection, services, conduits, manholes, valves, vaults, and other underground facilities. The Contractor shall survey the top of pipe for vertical and horizontal location. The survey shall use the same coordinates and datum as the Drawings. The surveying field report(s) shall be submitted with the Potholing Report.

F. Excavations around all underground utilities, including electrical ducts and conduits and natural gas and petroleum product pipelines, shall comply with all applicable laws and shall be performed using extreme caution to prevent injury to workers or damage to the utilities. Similar precautions shall be exercised around telephone and television cables.

G. The Contractor shall be responsible for complete potholing work, including means and method, excavation, trenching, shoring, material removal and disposal, backfilling, temporary and permanent and other associated work. All voids shall be filled using native soil compacted to 95%. Installation of low strength cement-sand slurry as approved by the City will be acceptable to fill voids. Existing surfaces shall be brought to original condition after completion of potholing.

H. The Contractor shall be responsible for protecting existing utilities, facilities, and trees. Any utilities, facilities, or trees damaged by Contractor's operations shall be repaired or replaced in kind by the Contractor at no additional cost to the City.

1.09 POTHOLING REPORT

A. The Contractor shall prepare and submit to the Engineer a Potholing Report, which shall identify each underground utility or point of connection and must include the following information for each: utility type, material, condition, dimensions, diameter, bedding material, horizontal and vertical location, station where it crosses any new City pipeline and conduit, elevation of the top and the bottom of the utility with reference to finished surface elevations, and clearance between the existing utility or facility and the new City facility(ies) to be constructed.

B. Any variation in the actual elevations and the elevations indicated on the Drawings shall be clearly marked in the Potholing Report and brought to Engineer's attention.

C. The complete Potholing Report shall be submitted to the Engineer, and accepted, with no exceptions taken, before the Contractor may submit final Shop Drawings for pipeline, conduit and other affected items.

D. If the Contractor does not expose all required utilities, the Contractor shall not be entitled to additional compensation for work necessary to avoid interferences nor for repair to damaged facilities.
1.10 REVISION TO SHOP DRAWINGS

A. The Contractor shall accurately show all applicable utilities and connection points on the pipe Shop Drawings and other applicable submittals and shall be responsible for incorporating actual field conditions into the pipe Shop Drawings and other applicable submittals.

B. The Contractor shall provide a copy of the accepted Potholing Report to the pipe manufacturer(s) and shall coordinate any necessary revisions to pipeline and conduit alignment, profile or grade(s) with the manufacturer(s).

C. Final shop drawings for City pipeline and conduits shall be revised as required and submitted for approval.

1.11 TEMPORARY TRAFFIC CONTROL

A. The Contractor shall submit temporary traffic control plans to the City for performing potholing repairing surface, and associated work. Submittal to the City shall be done at least three weeks prior to start of potholing.

B. The Contractor shall install temporary traffic controls as approved by the City and remove them after they are no longer required.

C. Refer to Section 01 55 26 for additional requirements.

END OF SECTION
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PART 1 - GENERAL

1.01 STATUTORY REQUIREMENTS

A. The work of this Section shall comply with current versions, with revisions, of the following:

1. Construction Safety Orders, Division of Industrial Safety, State of California
2. California Division of Occupational Safety and Health (Cal-OSHA)
3. California Code of Regulations (CCR)

1.02 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and demolish, modify, relocate, remove and dispose of work specified in the Contract Documents.

B. Work includes, but is not limited to, demolition, modifications, relocation, and removal of existing materials and equipment or work necessary to install the new work as specified in the Contract Documents and to connect with existing work in an approved manner.

C. Demolition, modifications and removals that may be specified under other Sections shall conform to requirements of this Section.

D. Partial or complete demolition, relocation and modifications include, but are not limited to:

1. Concrete pads, curb, gutters, and ditches
2. A.C. pavement, including aggregate base
3. Electrical conduits, wires, pull boxes, and appurtenances
4. Communication conduits, wires, pull boxes, and appurtenances
5. Instruments and related conduits and wires
6. Irrigation pump, piping, sprinkler heads, control valves, controller, flowmeter, and backflow device
7. Radio and antenna pole
8. Cabinets
9. Junction boxes
10. Fence and gates
11. Water piping and valves
12. Abandoned utilities
13. Existing utilities
14. Miscellaneous metals
15. Earth material, debris and boulders
16. Trees and shrubs
17. Existing electrical service and meter
18. Components shown on the Drawings
19. Others, as required to complete the Work

E. Blasting and the use of explosives will not be permitted for any demolition work.

F. Coordinate with owners of facilities to be demolished and/or modified, including the City and utility companies, as appropriate.

G. Oak trees shall not be removed unless otherwise noted or allowed by the City.

1.03 RELATED WORK

Temporary Environmental Controls is included in Section 01 56 00.

1.04 SITE VISIT

It is the responsibility of the Bidders to visit the work site and make their own determinations and conclusions as to the extent and difficulty of performing the demolition, relocation and modification work required in accordance with the Contract Documents.

1.05 JOB CONDITIONS

A. Protection

1. Execute the demolition and removal work such that damage or injury to structures, occupants thereof and adjacent features are avoided, and so as not to interfere with the use and free and safe passage to and from adjacent structures.

2. Closing or obstructing of roadways, sidewalks and passageways adjacent to the work by the placement or storage of materials will not be permitted and all operations shall be conducted with a minimum interference to traffic on these ways.

3. Erect and maintain barriers, lights, sidewalk sheds and other required protective devices.
B. Conditions of Structures

1. Conditions existing at the time of inspection for bidding purposes will be maintained by the City insofar as practicable. However, variations within a structure may occur prior to the start of demolition work.

C. Traffic Access

1. Conduct operations to ensure minimum interference with roads, streets, walkways both onsite and offsite and to ensure minimum interference with occupied or used facilities.

2. Do not close or obstruct streets, driveways or other occupied or used facilities unless otherwise shown on the Drawings or as given permission from the City and the local agency having jurisdiction. Furnish alternate routes around closed or obstructed traffic in access ways.

1.06 NOTIFICATION

At least 48 hours prior to commencement of operation, notify the City of the proposed schedule, therefore.

1.07 PROTECTION AND PRESERVATION

A. Existing facilities that are to remain in place or to be removed for refurbishment and/or reinstallation shall be protected by the Contractor.

B. Existing trees and shrubs that are to remain in place and not interfering with new construction shall be protected in place. Oak trees shall not be removed unless otherwise noted or allowed by the City.

C. Erect and maintain shoring, barriers, fences, lights, sidewalk sheds and other required protective devices to protect existing structures and utilities and to provide safety for personnel.

D. Promptly repair damage caused to adjacent facilities by demolition operation at no additional cost to the City. Repairs shall be made to a condition at least equal to that which existed prior to construction.

1.08 DISPOSAL OF MATERIAL

A. Materials and items of equipment identified on the Drawings and by the City as salvageable shall remain the property of the City and delivered to the City’s yard. Any such material damaged due to improper handling will not be accepted and the replacement value of the material deducted from the
payment to the Contractor. The City’s yard is located at 1993 Rancho Conejo Boulevard, Newbury Park, CA, 91320.

B. All other material and items of equipment shall become the Contractor's property and must be removed from the work site.

C. The storage or sale of removed items on the work site will not be allowed.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall demolish, remove and dispose of all existing facilities identified in the Contract Documents for removal.

B. No explosives shall be used in the demolition procedures.

C. All materials and equipment removed from the existing work shall become the property of the Contractor unless otherwise noted.

D. Dispose of all demolition materials, equipment and debris from the work site and in conformance with all existing applicable laws and regulations.

E. Debris and refuse generated by demolition operations shall be disposed of by the Contractor at his expense. The Contractor shall not allow the accumulation of debris or refuse in any quantity that represents a health or safety hazard or that impairs any operation on the work site. All debris and refuse shall be disposed of offsite in a timely manner. No debris or refuse shall be used as fill material or to fill voids caused by the removal of structures. Care shall be taken to prevent spillage on haul routes. Any such spillage shall be removed immediately, and the area shall be cleaned to the satisfaction of the City and the agency having jurisdiction.

F. Pollution Controls

1. Use water sprinkling, temporary enclosures and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.

   a. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding and pollution.
b. Clean all affected structures, facilities, and improvements of dust, dirt and debris caused by demolition operations. Bring all affected areas to conditions existing prior to the start of the work.

G. After removal of subgrade facilities, voids shall be backfilled using aggregate base material compacted to a 95% relative compaction density or cement-sand slurry unless otherwise noted. Unless otherwise shown, finished surface shall be the same as adjacent existing finished surface.

H. All voids and holes caused by removal of existing anchors, hardware, bolts or similar items shall be repaired using approved cementitious or epoxy mortar in concrete and masonry structures.

I. Aboveground conduits required to be removed shall be removed including wires, anchors, supports, etc. Existing conduits to be abandoned in place shall be sealed at open ends using approved polyethylene tapered plug. Existing conduits to be abandoned in place shall be removed at least 12” from the finished surface and open ends shall be sealed using approved plug and tape.

J. Existing abandoned utilities interfering with new construction shall be removed at no additional cost to the City and as approved by the City.

K. Open ends of existing utilities to be abandoned shall be plugged as shown on the drawings.

L. Modify existing facilities as identified and shown in the Contract Documents.

M. Relocate existing facilities as identified and shown in the Contract Documents. All appurtenances, piping, valves, conduits and other pertinent items shall be extended, or relocated, or installed new, as required and as shown on the Drawings to ensure satisfactory operation of all relocated facilities, as determined by the Engineer.

N. Finished surface shall be restored with similar materials and to the grade existing prior to demolition, unless otherwise shown.

O. Existing facilities to remain shall not be removed or modified unless otherwise approved by the City in writing.

3.02 SCHEDULE

A. The Contractor shall determine schedule for demolition, modification, and relocation per his discretion, except as noted below.
1. Items required for continuation operation of the existing facilities during construction shall not be demolished until new items are installed and ready for operation.

2. Items required to be in continuation operation during construction shall not be demolished. If required, temporary relocation shall be performed in accordance with Paragraph 3.03.

3. Prior to demolition of the existing facilities affecting operation of the existing instruments, equipment, controls, and auxiliary devices, installation of temporary power and control systems, including conduits, wires, connections, instruments, etc. shall be completed in accordance with the Contract Documents. See Section 16 20 00 for additional requirements.

3.03 REMOVAL OR MODIFICATION OF EXISTING FACILITIES TO REMAIN

A. If required, remove existing facilities interfering with new construction as approved by the City in writing. All existing facilities removed by the Contractor shall be replaced with new in kind, as approved by the City, and in accordance with the Contract Documents.

B. If required, relocate existing facilities interfering with new construction as approved by the City in writing. All existing facilities temporarily relocated or modified by the Contractor shall be reinstalled, as approved by the City, and in accordance with the Contract Documents.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Design, furnish, install, operate, monitor, maintain and remove a temporary dewatering system as required to lower and control water levels 6 inches minimum below subgrades of excavations to permit construction in the dry.

B. Collect and properly dispose of all discharge water from the dewatering and drainage systems in accordance with Specification Section 01 56 00, Temporary Environmental Controls, and as specified herein.

C. Dewatering water must be handled per Paragraph 3.03.N.

1.02 CONTRACTOR’S DESIGN AND RESPONSIBILITY

A. Contractor is responsible for:

1. Design and execution of methods for controlling surface water and groundwater.

2. Collection and transportation of water removed from excavations and handling and disposal of such water in legal manner.

3. Repair of damage to properties, buildings, structures, sewers and other utility installations, or pavements.

4. Work that may result from dewatering or surface water control operations.

B. Design review and field monitoring activities by the City or by the Engineer shall not relieve the Contractor of his/her responsibilities for the Work.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01 32 19, detailed plans of the proposed dewatering method and equipment, as specified in Paragraph 3.03 below.

B. Submit to the Engineer the proposed use and location for use of water generated from excavation dewatering activity.
1.04 DEFINITIONS

Where the phrase “in-the-dry” is used in this Section, it shall be defined to mean a soil condition such that the in-place moisture content of the soil at that time is no more than two percentage points above the optimum moisture content of that soil as determined by the laboratory test of the moisture-density ratio appropriate to the specified level of compaction.

1.05 FINES

A. The Contractor shall bear the costs of any fines levied against the Contractor or the City for failure to comply with applicable laws, regulations, provisions and requirements during or as a result of construction under this Contract due to the Contractor’s negligent acts.

B. The City will retain from the Contractor’s Partial Payments monies necessary to pay such fines levied against the City plus 25 percent of such fines for potential costs of coordination and administration efforts and acquiring technical and legal advice.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pipe for observation wells, if required, shall consist of minimum 1-inch I.D., Schedule 80 PVC pipe and machine slotted PVC well points, maximum slot size 0.020-inches.

B. Desilting tank(s) of appropriate size shall be provided, if required, to handle and hold surface and groundwater prior to discharging.

PART 3 - EXECUTION

3.01 GENERAL

Control surface water and groundwater such that excavation to final grade is made in-the-dry, the bearing soils are maintained undisturbed, and softening and/or instability or disturbance due to the presence or seepage of water does not occur. All construction and backfilling shall be performed in-the-dry and flotation of completed portions of work shall be prohibited.
3.02 **SURFACE WATER CONTROL**

Construct surface water control measures, including dikes, ditches, sumps and other methods to prevent flow of surface water into excavations.

3.03 **EXCAVATION DEWATERING**

A. At all times during construction, furnish and maintain proper equipment and facilities to promptly remove and properly dispose of all water within or entering excavations. Excavations shall be kept dry to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.

B. All trenches and excavations shall be dewatered prior to excavation to maintain a water level at least six inches minimum below the level of the trench bottom.

C. Pipe and concrete shall not be laid in water or submerged. Water shall not flow over new concrete structures within 3 Calendar Days after placement.

D. In no event shall water rise to cause unbalanced pressure on structures until the concrete or mortar has set at least 24 hours. Prevent flotation of the pipe by promptly placing backfill.

E. Dewatering shall be conducted at all times in such a manner as to preserve the natural undisturbed capacity of the subgrade soils at proposed bottom of excavation. If the subgrade of the trench bottom or excavation becomes disturbed due to inadequate drainage, excavate below normal grade as directed by the City and refill with crushed rock all at the Contractor's expense.

F. Dewatering pipes, desilting tank(s), monitoring wells and other associated dewatering equipment shall be within the City-held property or permanent or temporary easements, as approved by the City. No equipment shall be constructed or installed in private right-of-way without written permission from the City of occupied property.

G. Evaluate the impact of the anticipated subsurface soil/water conditions on the proposed method of excavation and removal of water.

H. Where groundwater level is above the proposed bottom of excavation level, it is expected that some type of pumped dewatering system will be required for pre-drainage of the soils prior to final excavation and for maintaining the lowered groundwater level until construction has been completed to such an extent that the structure, pipeline or fill will not be floated or otherwise damaged. It is further expected that the type of system, spacing of dewatering units and other details of the work will have to be varied depending on soil/water conditions at a particular location.
I. At least 2 weeks prior to the start of construction in any areas of anticipated dewatering, submit to the Engineer for review, a proposed initial plan for removal of water, method of excavation and support of the excavation. Do not proceed with construction in any of these areas until the initial plan has been favorably reviewed by the Engineer. It is expected that the initial plan may have to be modified to suit the variable soil/water conditions to be encountered.

J. Dewater and excavate, at all times, in a manner that does not cause loss of ground or disturbance to the pipe bearing soil or soil which supports overlying or adjacent structures.

K. If the method of dewatering does not properly dewater the trench as specified, installation of groundwater observation wells may be required as directed by the Engineer. Do not place any pipe or structure until the readings obtained from the observation wells indicate that the groundwater has been lowered a minimum of 6 inches below the bottom of the final excavation within the trench limits.

L. Dewatering units used in the work shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from the dewatering system shall be continuous until pipe is adequately backfilled or until concrete structure has set for 3 Calendar Days. Stand-by pumps shall be provided.

M. Water entering the excavation from precipitation or surface runoff shall be collected, handled and disposed of as described in 3.03.N.

N. Handling and Disposal of Water Derived from Dewatering of Excavations:
   1. No Regional Board dewatering permit is required or has been obtained for this project.
   2. Handling, disposal, and beneficial use of water derived from dewatering shall be the responsibility of the Contractor.
   3. Debris from water shall be removed prior to discharging any water. All debris shall be separated/filtered out prior to reusing water. All debris shall be disposed of off the Site in a legal manner.
   4. Water from trench or excavation dewatering must be handled and disposed of using one or multiple methods described below.
      a. At pump station site, use water for dust control or irrigating earthen slopes within City’s La Granada Reservoir property. The Contractor shall make all necessary arrangements for conveying the water to the points of use.
b. Discharge into City’s wastewater system with prior notification to the City Project Manager. Provide at least 7 days advance notice to the City prior to discharging into the existing wastewater system. Coordinate with the City for location of discharge. The Contractor shall make all necessary arrangements for conveying the water to the points of discharge.

c. Dispose of at another location for which the Contractor has written approval from the property owner for such activity.

d. Haul away in water trucks or similar vehicles and dispose of in a lawful manner satisfactory to the City.

END OF SECTION
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PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and equipment required and perform all site clearing and grubbing, complete as specified herein, as shown on the Drawings and as required to complete the Work.

B. Obtain all permits required for site preparation work prior to proceeding with the work, including clearing and tree removal.

C. The areas to be cleared, grubbed and stripped within public rights-of-way and utility easements shall be minimized to the extent possible for the scope of work and in consideration of the actual means and methods of construction used. No unnecessary site preparation within these areas shall be performed.

1.02 RELATED WORK

A. Temporary Environmental Controls are included in Section 01 56 00.

B. Earthwork is included in Section 02 20 00.

C. Miscellaneous Work is included in Section 02 99 00.

1.03 SUBMITTALS

Submit to the City, in accordance with Section 01 32 19, copies of all permits required prior to clearing, grubbing, and stripping work.

1.04 PERMITS

The Contractor shall obtain permit from the City for removal or trimming of any oak trees. The Contractor shall obtain permit from the City to work within oak tree canopy. See Section 01 11 00 for additional requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CLEARING

A. Oak trees shall not be removed or trimmed unless otherwise noted or approved by the City. Obtain permit from the City prior to working within any oak tree canopy area.
B. Where trees, shrubs or any vegetation are indicated or specified to be removed, in whole or in part, the Contractor shall accomplish such removal and subsequent disposal at his sole expense under the Contract and no extra payment will be made therefor. Where roots of trees are severed sufficiently in the opinion of the City to create a hazardous condition, such trees shall be removed and disposed of by the Contractor at no additional cost to the City. Cut and remove all trees, stumps, brush, shrubs, roots, grass, weeds, rubbish and any other objectionable material resting on or protruding through the surface of the ground. Existing tree may have been burnt during recent fires.

C. Unless otherwise shown, within trench limits and footprints of facilities to be constructed, all vegetation, including trees and shrubs, shall be removed; however, the extension of limits beyond that specified or indicated, owing to the Contractor's error, or for reasons of his convenience, or for any other reason, shall not be just cause for removal or damage to any trees, shrubs, etc.

D. Within public rights-of-way, the Contractor shall protect all trees, shrubs, and other vegetation except as indicated or specified otherwise.

E. The Contractor shall be liable for all damages and costs on account of any unauthorized removal of trees and other vegetation in connection with his operations and for damage to any such vegetation left standing, except for such cutting of roots as is absolutely necessary in order to complete the work in accordance with these specifications.

3.02 GRUBBING

A. Grub and remove all stumps, roots in excess of 1-1/2-inches in diameter, matted roots, brush, timber, logs, concrete rubble and other debris encountered to a depth of 18 inches below original grade or 18 inches beneath the bottom of foundations, whichever is deeper.

B. Refill all grubbing holes and depressions excavated below the original ground surface with suitable materials and compact to a density conforming to the surrounding ground surface in accordance with Section 02 20 00.

3.03 STRIPPING

A. Unless otherwise shown, strip 6 inches of topsoil from all areas to be occupied by structures and roadways and all areas to be excavated or filled.

B. No topsoil shall be stockpiled and reused unless otherwise noted or approved by the City. If use of existing topsoil for landscaping is specified on the Drawings, stockpiling of topsoil only in the required quantity will be allowed. Dispose of all unused topsoil in accordance with applicable regulations.

3.04 DISPOSAL

A. Dispose of material and debris from site preparation operations by hauling such materials and debris to an approved offsite disposal area. No rubbish or debris of any kind shall be buried on the site.
B. Burning of cleared and grubbed materials or other fires for any reason will not be permitted.

3.05 PROTECTION

A. Conduct clearing operations in a manner to prevent damage to trees and vegetation designated to remain and to the work being constructed and to provide for the safety of employees and others. Trees and other vegetation to remain shall be protected from damage by all construction operations as required. This may include installations of temporary fences or other suitable barriers, guards, and enclosures, as approved by the City. Unless otherwise noted, all oak trees shall be protected.

B. All vegetation, including trees and shrubs, shall be protected in place unless removal or modification of such is allowed in writing by the City.

C. Pruning: Trees not removed shall be protected in place. Tree branches interfering with construction operations shall be cut off to the boles in a workmanlike manner, as necessary. The Contractor shall remove additional tree branches under the direction of the Engineer, in such a manner that the tree will present a balanced appearance. Cuts over 1 inch in diameter shall be immediately treated with an acceptable tree wound paint.

D. Maintain protection until all work in the vicinity of the trees or vegetation being protected has been completed.

E. Do not operate heavy equipment or stockpile materials within the branch spread of existing trees.

F. Immediately repair any damage to existing tree crowns, trunks, or root systems. Roots exposed and/or damaged during the work shall immediately be cut off cleanly inside the exposed or damaged area. Treat cut surfaces with an acceptable tree wound paint and topsoil spread over the exposed root area.

G. When work is completed, remove all dead and downed trees. Live trees shall be trimmed of all dead and diseased limbs and branches. All cuts shall be cleanly made at their juncture with the trunk or preceding branch without injury to the trunk or remaining branches. Cuts over 1 inch in diameter shall be treated with an acceptable tree wound paint.

H. Restrict construction activities to those areas within the limits of construction designated on the Drawings. Adjacent properties and improvements thereon, public or private, which become damaged by construction operations shall be promptly restored to their original condition, to the full satisfaction of the City and at no additional cost to the City.

END OF SECTION
PART 1 - GENERAL

1.01 STATUTORY REQUIREMENTS

A. The work of this Section shall comply with current versions, with revisions, of the following:

1. Construction Safety Orders, Division of Industrial Safety, State of California
2. California Department of Public Health (CDPH)
3. California Division of Occupational Safety and Health (Cal-OSHA)
4. California Code of Regulations (CCR)

B. The Contractor shall comply with the provisions for “Shoring and Bracing Drawings” in Section 6705 of the California Labor Code. The Contractor, prior to beginning any trench or structure excavation 5 feet deep or greater, shall submit to the Engineer and shall be in possession of the Engineer’s written acceptance for record of the Contractor’s detailed plan showing design of all shoring, bracing, sloping of the sides of all excavations, or other provisions for worker protection against the hazard of caving ground during the excavation of such trenches or structure excavation. If such plan varies from the shoring system established in the Construction Safety Orders of the State of California, such alternative system plans shall be prepared, signed, and stamped by a civil or structural engineer licensed in the State of California.

1.02 SCOPE OF WORK

A. It shall be the responsibility of the Contractor to allow for, excavate, segregate, and place in acceptable locations any unsuitable material encountered. The Contractor shall replace any unsuitable material with suitable compacted general fill, select fill or soil-cement conforming to the Contract Documents. All unsuitable material removal, relocation, and/or disposal for construction purposes shall be the responsibility of the Contractor.

B. The Contractor shall furnish all labor, materials, equipment and incidentals required and perform all excavation and grading work; haul excavated material from and to the project site; stockpile, screen and segregate excavated material; prepare existing ground surfaces and sub-bases, place and compact fill and backfill materials; construct cut and fill slopes; and dispose of waste and
surplus materials as specified herein, as shown on the Drawings and as required to complete earthwork.

C. The Contractor shall provide the services of a licensed land surveyor registered in the State of California to provide all required survey adequate to properly construct all facilities.

D. The Contractor shall provide the services of a licensed civil or structural engineer, registered in the State of California to prepare temporary excavation support system designs and submittals as required.

E. The Contractor shall design, furnish and install temporary excavation support systems, including sheeting, shoring and bracing, to ensure the safety of personnel and protect adjacent structures, utility, etc., in accordance with federal, state and local laws, regulations and requirements.

F. The Contractor shall furnish and install all imported materials and soil-cement as required to finish earthwork at no additional cost to the City.

G. Wherever the requirement for a specified percent compaction of soil material is referred to herein or on Drawings, it shall mean "at least the specified percent of maximum density as determined by ASTM D1557".

1.03 RELATED WORK

A. Dewatering and Drainage are included in Section 02 14 00.

B. Clearing and Grubbing are included in Section 02 15 00.

C. Trenching, Backfilling and Compaction are included in Section 02 22 00.

D. Granular and Rock Materials are included in Section 02 23 00.

E. Cement-Sand Slurry is included in the Section 02 25 00.

F. Sheeting, Shoring and Bracing are included in Section 02 40 00.

G. Miscellaneous Work is included in Section 02 99 00.

H. Concrete Work is included in Section 03 30 00.
1.04 SUBMITTALS

A. Submit to the Engineer in conformance with Section 01 32 19:

1. Copy of the excavation permit issued by the California Department of Industrial Relations.

2. Test reports of on-site select and imported materials.


1.05 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

3. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

4. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.06 QUALITY ASSURANCE

A. Prior to and during the placement of backfill and fill materials, including soil, cement-sand slurry and concrete, coordinate with the City to perform tests.

B. From time to time and at such time as deemed necessary during backfill operations, the City may make or cause to be made, tests of the backfill material to determine whether such compaction and/or compressive strength meets the minimum requirements specified for the various portions of the Work.

C. The City will bear costs for initial compaction and material testing at the selected locations; however, in areas where results of initial testing indicate the need for additional compaction, removal and reconpaction or removal and replacement, of backfill material, the Contractor shall bear the costs of retesting.
D. In every case, the quantity and location of specific points at which tests are to be made shall be selected by the City. The Contractor shall cooperate with and assist the City, as necessary, to perform the soils tests or taking of samples. When selected points for testing occur below the backfill surface, the Contractor shall excavate all materials in the area to such point and shall replace same following completion of testing. All cost of such excavations and replacements shall be borne by the Contractor as a part of his obligation under the Contract.

E. The Contractor shall remove material as required in any areas where compaction and/or compressive strength of the material when tested do not fully comply with these Specifications. The unsatisfactory material shall be promptly removed, after notification, and replaced with material that will conform to the specified requirements. Any additional costs for such required removal and recompaction or replacement of material shall be borne by the Contractor.

F. At his discretion, the City’s representative may observe the earthwork operation, including site preparation, excavation, and fill and backfill placement. The Contractor shall cooperate with and allow City’s representative to observe the earthwork operation.

1.07 DEFINITIONS

A. Where the phrase "in-the-dry" is used in this Section, it shall be defined to mean a soil condition such that the in-place moisture content of the soil at that time is no more than two percentage points above the optimum moisture content of that soil as determined by the laboratory test of the moisture-density relation appropriate to the specified level of compaction.

B. Where used in this Section, "structures" refers to below-grade vaults, all buildings and manholes. Stormwater structures smaller than 27 cubic feet in volume and duct banks are not considered structures in this context.

C. Where used in this Section, “compressive strength” in relation to backfill material, it refers to the tested compressive strength of cementitious backfill materials as specified elsewhere in the Contract Documents.

1.08 GEOTECHNICAL REPORT

A. No geotechnical analysis was performed for this project. Geotechnical information may be available from other sources, but none is available from the Owner or made part of the Contract Documents.

B. Any additional subsurface exploration required or deemed necessary by the Contractor shall be conducted at the Contractor’s expense.
C. Bidder shall include in his Bid all costs associated with groundwater control and dewatering, rock excavation and removal, special excavation requirements, including sheeting, shoring, and bracing, as required, and of fill and compaction requirements.

D. It shall be the responsibility of the Contractor to determine, allow for, excavate, remove and dispose of, as necessary, any unsuitable rock or material encountered. All unsuitable rock or material removal and disposal for construction purposes shall be the responsibility of the Contractor and shall be paid in accordance with the appropriate bid items.

E. The Contractor should expect to encounter non-cohesive material in the bedding, pipe zone, and backfill of trench zones for existing utilities and facilities.

PART 2 - PRODUCTS

2.01 GENERAL

A. Unless otherwise specified in this Section, granular and rock materials shall be in accordance with Section 02 23 00. Materials to be used for trench construction are specified in Section 02 22 00.

B. Timber used for excavation support systems shall be pressure treated with wood preservative for ground contact.

2.02 FILL MATERIALS

A. Imported Fill Material

1. Imported fill material shall consist of imported material free of organics, trash, debris, and corrosive, or other deleterious, unsuitable, or hazardous materials.

2. Material should be well-graded, non-expansive soil with Elasticity Index (EI) less than 20, Sand Equivalent (SE) greater than 20, and Plasticity Index (PI) less than 15.
3. The gradation limits shall be as follows.

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<th>Sieve Sizes</th>
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<td>3 inches</td>
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<tr>
<td>3/8 inches</td>
<td>70-100</td>
</tr>
<tr>
<td>No. 4</td>
<td>35-90</td>
</tr>
<tr>
<td>No. 40</td>
<td>30-85</td>
</tr>
<tr>
<td>No. 100</td>
<td>15-65</td>
</tr>
<tr>
<td>No. 200</td>
<td>Less than 10</td>
</tr>
</tbody>
</table>

B. On-Site Select Fill Material

1. On-site material is the material generated during excavation and grading at the Site. On-Site Select Fill Material shall be derived from the on-site material that meet the following requirements:
   a. Material shall be granular material, free of organics, trash, debris, corrosive, and other deleterious or unsuitable material.
   b. Material shall be free of rock over 3 inches in longest dimension.
   c. Material shall have an Expansion Index of less than 60.

2. Processing of excavated on-site material, including segregating, screening, removing unsuitable material, breaking down oversized material, stockpiling, mixing with imported material, etc., may be needed to make it suitable for use as On-Site Select Fill Material.

3. On-Site Select Fill Material shall be thoroughly mixed prior to using as fill material.

4. Imported Fill Material may be mixed with on-site material as required to make it suitable as On-Site Select Fill Material meeting the requirements specified in Paragraph B.1. above and to achieve required compaction.

C. Cement-Sand Slurry

1. Cement-sand slurry shall be in accordance with Section 02 25 00.
2.03  **SOIL BINDER**

Soil binder shall be a mixture of synthetic polymer emulsion concentrate and water. Amount of water shall be per the manufacturer’s recommendations. Soil binder shall be designed specifically for dust palliative and soil stabilization. Soil binder shall be SMT 310 as supplied by SealMaster or approved equivalent.

**PART 3 - EXECUTION**

3.01  **PREPARATION**

A.  **Exploratory Excavations**

1. Perform exploratory excavation work (pothole) for verifying the location of underground utilities and structures prior to commencing excavation work.

2. Record location and elevation of existing utilities investigations on project record drawing as well as including such information in the Pothole Report.

3. Pothole excavations shall be backfilled as soon as the desired information has been obtained. Backfilled surfaces shall be stabilized, and finished surface shall be restored in accordance with encroachment permit requirements and these Specifications, as applicable.

B.  **Dewatering and Drainage Systems**

1. Any necessary temporary dewatering and drainage systems if needed shall be in place and operational prior to start of excavation work in accordance with Section 02 14 00.

3.02  **PROTECTION OF EXISTING FACILITIES**

A. Protect all existing facilities to remain in place from damage due to earthwork activities. No equipment that exceeds AASHTO H20 loading shall be operated and no material shall be stockpiled within four feet of the outside face of any existing pipelines, buildings, vaults, or concrete foundations unless approved in writing by the City.

B. Install temporary shoring as required to protect existing facilities in place.

C. Trees identified to be protected and trees that do not interfere with the construction activities shall be protected in accordance with the requirements of these Specifications and as shown on the Drawings.
3.03 TEMPORARY EXCAVATIONS AND SLOPES

A. The Contractor is solely responsible for the design, construction, maintenance, stability, and safety of temporary excavations and slopes. This may include, but not limited to, determination of site conditions, required plan areas and depths of excavations, inclination of slopes, shoring requirements, slope stability requirements, slope protection requirements, measures to be implemented for job site and workers' safety, and impact of construction activities.

B. Temporary excavations and slopes shall conform to federal Occupational and Health Administration (OSHA) regulations and any other local ordinances and building codes, as applicable. All temporary slopes greater than 20 feet in height shall be designed by a registered professional practicing in the State of California.

C. The Contractor shall include costs of all work to be performed to construct temporary excavations and slopes in accordance with the requirements of the Contract Documents in his/her bid. No extra payment shall be due to the Contractor for temporary excavations, slopes supports, and strengthening devices.

3.04 SITE PREPARATION

A. Those portions of the project site to be occupied by structures and paved areas and within the limits of required earthwork shall be stripped and cleared of all existing construction debris, organic material and vegetation, foundations, pavements, base material, unsuitable fill materials, or other deleterious materials, and the materials removed from the areas to be graded.

B. Existing topsoil shall be removed to a depth of at least 6 inches within the limits of required earthwork under new structures and adjacent fill embankments and cut slopes. Deeper removal may be required where organic or other deleterious materials are encountered. If use of existing topsoil for landscaping is specified on the Drawings, stockpiling of topsoil only in the required quantity will be allowed.

C. All deleterious materials and topsoil (except the quantity of topsoil to be used for landscaping as noted on the Drawings) thus removed shall be disposed of by the Contractor, off the site of the work in a lawful manner satisfactory to the City and to any public or private agencies having jurisdiction. Removal of such materials shall be accomplished before the start of any required excavations.
3.05 EXCAVATION SUPPORT

Excavation support shall be in accordance with Section 02 40 00.

3.06 EXCAVATION AND OVER EXCAVATION

A. The Contractor shall perform all excavation necessary or required for the construction of the buildings, vaults and other facilities as shown on the Drawings.

B. Excavations shall be suitably wide for construction of the facilities, including excavation supports, dewatering, drainage systems and working clearances as required.

C. Excavation for structures shall be carried to lines and grades as shown on the Drawings and as specified, and shall include removal and disposal of all unusable materials encountered regardless of their nature, including any and all obstruction that would interfere with furnishing, placing and maintaining of shoring and bracing, necessary to safely support the sides of the excavation and required to properly accommodate construction of such structures to the dimensions shown on the Drawings or as directed.

D. Excavation shall be performed in-the-dry and shall be accomplished by methods that preserve the undisturbed state of subgrade soils. If required, necessary drainage and dewatering systems shall be in place and operational prior to beginning excavation work in accordance with Section 02 14 00.

E. Contractor shall be responsible for any damage to persons or property due to such drainage water or to interruption or diversion of such storm water on account of his operations. In no case shall the earth be plowed, scraped or excavated by any means so near to the finished subgrade that would disturb the finished subgrade.

F. When excavations have reached the required subgrade, including any allowances for working mats or base materials, prior to the placement of working mats or base materials, notify the City for soils testing. If the existing subgrade soils are determined to be unsuitable, direction will be provided by the City regarding removal and replacement with suitable materials. If Contractor believes that such direction would increase Contractor's cost and would thereby entitle Contractor to Extra Work, Contractor shall notify the City in accordance with the applicable Sections of the General Conditions pertaining to changes in the Work.

G. If subgrade is unsatisfactory for support of structures as a result of inadequate excavation, dewatering, or other construction methods, it shall be removed and replaced with 2-sack cement-sand slurry or suitable crushed rock wrapped in
geotextile material, subject to prior approval by the City, at no additional cost to the City.

H. Over-Excavation

1. Over-excavation shall be performed as indicated on the Drawings.

2. The City’s representative will observe the condition of the subgrade exposed after over-excavation. If disturbed, unsuitable, or extensively fractured earth materials or fill are encountered, additional over-excavation may be required as directed in writing by the City.

3. If the Contractor over-excavates below the required grade through error, for his own convenience, or through failure to dewater the excavation properly, or disturbs the subgrade before dewatering is sufficiently complete, Contractor may be directed by the City to perform the following remedial measures. This work shall not be considered Extra Work.

   a. Properly dewater the area.

   b. Excavate below the design subgrade.

   c. Refill the over-excavated area using crushed rock material wrapped in geotextile filter fabric, imported fill material, or 2-sack cement-sand slurry, as determined by the City, to the elevation of the design subgrade.

I. No blasting shall be permitted.

3.07 TEMPORARY STOCKPILING

A. The Contractor shall be responsible for temporary stockpiling of excavated material, including acquiring any necessary rights of way and hauling from and to the Site.

B. All existing ground surface where material is to be stockpiled shall be covered with temporary geotextile fabric or PVC 30 mil sheets. Temporary fabric (or PVC sheets) shall be removed after it is no longer required.

C. All stockpiled soils shall be stabilized by spraying approved soil binder as required for dust control to the satisfaction of the City.

3.08 SUBGRADE PREPARATION

A. After completion of excavation to the required lines and grades, subgrade (sub-base soil) shall be prepared prior to placing, fill, fill slopes, backfill, or structures. Unless otherwise shown on the Drawings, scarify subgrade to 6
inches and compact to a minimum of 95 percent of ASTM D1557 maximum density at or near its optimum moisture content (0 to 2 percent).

B. Subgrade soils shall be compacted to provide a smooth, firm, and unyielding foundation. Surface deformations shall not exceed 1/2 inch.

C. Standing water and mud and shall be removed prior to placement of material over the subgrade.

D. Subgrade shall be free of rocks larger than 1 1/2 inches (in longest dimension) or other sharp objects. Remove all unsuitable material and rocks prior to performing compaction of scarified subgrade soil.

3.09 FILLING AND BACKFILLING - GENERAL

A. Fill and backfill materials shall be as shown on the Drawings and as specified herein.

B. The Contractor shall furnish and place Imported Fill Material as required to complete the fill and backfill work.

C. Fill and backfill materials shall be placed in lifts not exceeding 8 inches (measured before compaction) to suit the specified compaction requirements to the lines and grades required, making allowances for settlement and placement of cover materials (e.g., topsoil, sod). Soft spots shall be corrected.

D. Compaction in open areas may be accomplished by any of the following methods: compaction equipment, tracked dozers weighing at least 30,000 lbs. and operated at speeds sufficient to achieve specified compaction, or heavy vibratory rollers. Compaction in confined areas (including areas within a 45 degree angle extending upward and outward from the base of a wall) and in areas where the use of large equipment is impractical, shall be accomplished by hand operated vibratory equipment or mechanical tampers. Lift thickness shall not exceed 6 inches (measured before compaction) when hand operated equipment is used.

E. Fill and backfill shall not be placed and compacted when the materials are too wet to properly compact (i.e., when the in-place moisture content of the soil is more than two percentage points above the optimum moisture content as determined by a laboratory test for the specified level of compaction). Wet soils shall be dried and brought to in-the-dry condition prior to placing fill or backfill.

F. All fill and backfill layers shall be thoroughly blade-mixed during spreading to provide uniform material within each layer. Soft or yielding material shall be removed and be replaced with properly compacted fill material prior to placing
the next layer. All fills and fill slopes shall be over-filled and trimmed back to obtain a firm surface. Fill slopes shall be thoroughly rolled with sheepfoot roller after 2 feet of fill.

G. In lieu of On-Site Select Fill Material, the Contractor may furnish and place Imported Fill Material, at his/her discretion, after approval by the City and at no additional cost to the City.

3.10 FILL AND BACKFILL UNDER STRUCTURAL CONCRETE SLABS

A. Fill beneath building slabs or slabs on grade (except sidewalks) shall be 6-inch thick minimum Caltrans Class 2 aggregate base. If required, the fill material below the aggregate base material shall be Imported Fill Material at least for 12 inches depth. If required, the fill material below 12-inch thick Imported Fill Material shall be On-Site Select Fill Material or Imported Fill Material. All aggregate base and fill material shall be compacted to 95% relative density.

B. Fill beneath sidewalks shall be 6-inch thick minimum Caltrans Class 2 aggregate base. If required, the fill material below the aggregate base shall be On-Site Select Fill Material or Imported Fill Material. All aggregate base and fill material shall be compacted to 95% relative density.

3.11 FILL AND BACKFILL AT BUILDING AND RETAINING WALL FOUNDATIONS AND BELOW-GRADE CONCRETE STRUCTURES

A. Fill beneath building foundations, below-grade concrete structures and retaining wall foundations shall be 6-inch thick minimum Caltrans Class 2 aggregate base. If required, the fill material below the aggregate base material shall be Imported Fill Material at least for 12 inches depth. If required, the fill material below 12-inch thick Imported Fill Material shall be On-Site Select Fill Material or Imported Fill Material. All aggregate base and fill material shall be compacted to 95% relative density.

B. Aggregate base shall extend at least 3 feet beyond outer edges of building foundations.

C. Aggregate base shall extend at least 2 feet beyond outer edges of foundations for retaining walls and buried concrete structures or up to property line, whichever is the shorter distance.

D. Dampproofing/waterproofing shall be completed prior to placing fill or backfill around structures.

E. Fill or backfill shall not be placed against concrete structures until concrete has cured for at least 14 Calendar Days or attained at least 75% of 28 Calendar Day compressive strength, whichever is a shorter period.
F. Place and compact fill material uniformly around the structure.

G. Care shall be taken to prevent damage to or displacement of the structures by compaction equipment.

3.12 FILL AND BACKFILL UNDER PAVEMENTS, CURBS, GUTTERS, AND DITCHES.

A. Fill below asphalt and concrete pavements, curbs, gutters, and ditches shall be 6-inch thick minimum Caltrans Class 2 aggregate base compacted to 95% relative density.

B. If fill is to be placed to bring subgrade up to the bottom of aggregate base, it shall be On-Site Select Fill Material or Imported Fill Material. All fill material shall be compacted to 95% relative density.

3.13 EMBANKMENT FILL AND FILL SLOPES

A. Prior to placing embankment fill and fill slope materials, existing ground shall be prepared per Paragraph 3.04. If the subgrade slopes are steeper than 5:1, the subgrade shall be stepped to produce a stable, horizontal surface for the placement of embankment materials. The existing subgrade shall then be scarified to a depth of at least 6 inches and compacted to 95% relative density.

B. Embankment fill and fill slope materials shall consist of On-Site Select Fill or Imported Fill Materials and shall be placed and compacted in even lifts of 8 inches or less. Unless otherwise shown, materials shall be compacted to 95% relative density at or near its optimum moisture content (0 to 2 percent).

3.14 COMPACCTION REQUIREMENTS

Unless otherwise specified herein or on the Drawings, fill or backfill materials shall be compacted to 95 percent modified proctor (ASTM D1557) at or near its optimum moisture content (0 to 2 percent).

3.15 DISPOSAL OF UNSUITABLE, WASTE AND/OR SURPLUS EXCAVATED MATERIAL

A. All waste and excess excavated materials shall become the property of the Contractor and must be disposed of off the site in a lawful manner. The City, at its discretion, reserves the right to take ownership and possession of samples of excavated materials.
B. Materials may be temporarily stockpiled in an area within the limits of construction that does not disrupt construction activities, create any nuisances or safety hazards, cause damage to existing facilities, or otherwise restrict access to the Site.

3.16 GRADING

A. Grading shall be performed to the lines and grades shown on the Drawings. All objectionable material encountered within the limits indicated shall be removed and disposed of. Subgrades shall be completely and continuously drained and dewatered throughout the grading process. Install temporary drains, drainage ditches, etc., to intercept or divert surface water that may affect the execution or condition of grading work.

B. If at the time of grading it is not possible to place any material in its proper section of the work, it shall be stockpiled in approved areas for later use. No extra payment will be made for the stockpiling or double handling of excavated material.

C. In cut areas, all loose or protruding rocks in slopes shall be removed to line or finished grade of the slope. All cut and fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Drawings unless otherwise directed by the City.

3.17 REPAIR

A. Repair and re-establish grades to specified elevations where completed or partially completed surfaces become eroded, rutted, or settled or where they lose compaction.

B. Where settling occurs within warranty period, remove finished surfacing, backfill with additional soil material in kind, compact, and reconstruct surfacing.

END OF SECTION
PART 1 - GENERAL

1.01 STATUTORY REQUIREMENTS

A. The work of this Section shall comply with current versions, with revisions, of the following:


B. The Contractor shall comply with the provisions for “Shoring and Bracing Drawings” in Section 6705 of the California Labor Code. Prior to beginning any trench or structure excavation 5 feet deep or over, the Contractor shall submit to the Engineer and shall be in possession of the Engineer’s written acceptance for record of the sides of excavation or other provisions for worker protection against the hazard of caving ground during the excavation of such trenches or structure excavation. If such plan varies from the shoring system established in the Construction Safety Orders of the State of California, such alternative system plans shall be prepared by a civil or structural engineer licensed in the State of California.

1.02 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform all trenching for pipelines, conduits, and appurtenances, including drainage, filling, backfilling, disposal of surplus material and restoration of trench surfaces and easements.

B. Excavation shall extend to the width and depth specified in the Contract Documents and shall provide suitable room for installing utilities and appurtenances.

C. The bottom of the excavation shall be firm, dry and in all respects, acceptable. All excavation except as specifically shown on the Drawings shall be made in open trenches.

D. Furnish and install temporary excavation support systems, including sheeting, shoring and bracing, to ensure the safety of personnel and protect adjacent structures, piping, and conduit; and to maintain construction within City’s property and easements, in accordance with federal, state and local laws, regulations and requirements.
E. Wherever the requirement for a specified percent compaction of soil material is referred to herein, it shall mean "at least the specified percent of maximum density as determined by ASTM D1557."

1.03 RELATED WORK

A. Temporary Traffic Controls are included in Section 01 55 26.
B. Granular and Rock Materials are included in Section 02 23 00.
C. Cement-Sand Slurry is included in Section 02 25 00.
D. Pavement and Base are included in Section 02 51 20.
E. Miscellaneous Work is included in Section 02 99 00.
F. Concrete Work is included in Section 03 30 00.
G. Conduits are included in Division 16.

1.04 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01 32 19, the following:
   1. Data for bedding and backfill materials, including sources of materials, gradation, testing data and backfilling and compaction method.
   2. Cement-sand slurry mix design and components.

1.05 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
   1. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
   2. ASTM D1557 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

PART 2 - PRODUCTS

2.01 MATERIALS

A. Imported fill material and on-site select fill material shall be in accordance with Section 02 20 00.
B. Crushed rock, sand, and aggregate base shall be as specified in Section 02 23 00.

C. Cement-sand slurry shall be as specified in Section 02 25 00.

2.02 TRENCH SECTION MATERIALS

Materials for trench section shall be as shown on the Drawings.

PART 3 - EXECUTION

3.01 TRENCH EXCAVATION

A. Trench excavation shall include material of every description and of whatever substance encountered. Asphalt and concrete pavement, if existing, shall be cut with a saw, wheel or pneumatic chisel along straight lines before excavating.

B. While excavating and backfilling is in progress, all utilities and other property protected.

C. Trenches shall be excavated to the depth indicated in the Contract Documents and in widths sufficient for laying the utilities. The bottom of the excavations shall be firm and dry and, in all respects, acceptable to the City. Trench width shall be within the limits indicated.

D. If water is encountered, dewatering shall be performed such that the water table under the trench shall always be maintained to at least 6 inches below the bottom of the trench during construction. Water shall not be allowed to rise into the trench at any time.

E. No trenches shall be allowed to remain open after working hours or overnight. At the end of the working day, trenches must either be backfilled or they must be plated to allow traffic. Steel plate shall be in accordance with City’s Road Design and Construction Standard Plate Nos. 8-18 and 8-19

3.02 DISPOSAL OF MATERIALS

A. Excavated material shall be stacked without excessive surcharge on the trench bank, shoring and existing underground and above ground facilities.

B. Excavated material shall be stacked without obstructing free access to existing facilities in operation.
C. All waste and excess excavated materials become the property of the Contractor and must be disposed of off the site in a lawful manner.

3.03 BACKFILLING

A. Trench backfilling shall be performed as shown on the Drawings

B. The Contractor shall exercise care in the placement and compaction of backfill. It shall be the Contractor’s responsibility to repair or replace pipe broken or damaged by the Contractor’s action at no extra cost of the City.

C. The Contractor shall take necessary measures to avoid floating of pipe and conduit when cement sand slurry is to be placed. Pipes and conduits shall be properly secured in place.

D. To prevent longitudinal movement of the pipe, dumping backfill material into the trench and then spreading will not be permitted.

E. Backfill shall be brought up evenly within the trench. Each layer of backfill material shall be thoroughly compacted by rolling, tamping, or vibrating, as applicable, with mechanical compacting equipment carefully selected to prevent damage to the pipeline, structures and appurtenances.

3.04 RESTORING TRENCH SURFACE

A. Restoration of asphalt pavement shall be performed as shown on the Drawings and in accordance with Section 02 51 20.

B. Restore concrete pavement as shown on the Drawings and in accordance with Section 03 30 00.

C. Placement of asphalt paving or concrete slab over cement-sand slurry may be performed as soon as the surface will withstand the paving process without displacement or disruption.

END OF SECTION
SECTION 02 23 00
GRANULAR AND ROCK MATERIALS

PART 1 - GENERAL

1.01 DESCRIPTION

Granular fill materials are specified in this Section, but their uses for bedding pipe, replacement of unsuitable material, pavement base, foundation support and similar uses are specified in detail elsewhere. Engineer may order the use of fill materials for purposes other than those specified in other sections or on the Drawings if, in his/her opinion, such use is advisable.

1.02 RELATED WORK

A. Earthwork is included in Section 02 20 00.

B. Trenching, Backfilling and Compaction are included in Section 02 22 00.

C. Asphalt Concrete Pavement and Base are included in Section 02 51 20.

1.03 SUBMITTALS

A. Submit to the Engineer in conformance with Section 01 32 19:

1. Test reports for granular materials, gradation and quality. Submit test reports for each material to be incorporated into the work.

2. Samples of granular materials in accordance with Standard Specifications for Public Works Construction (SSPWC), Subsection 306-1.3.7.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Crushed Rock

1. Crushed rock shall be uniformly graded, 3/4 inch maximum, and the product of crushing rock or gravel and shall fulfill the requirements and gradation of SSPWC Section 200-1.2. The material shall compact to a hard, firm, unyielding surface and shall remain stable when saturated with water.
B. Sand

1. All sand shall consist of natural or manufactured granular materials free from frost, frozen lumps, organic material, mica, loam, clay and other deleterious substances.

2. Sand used for the Pipe Bedding Zone and the Pipe Zone shall conform to SSPWC Section 200-1.5.2 having minimum sand equivalent (SE) of 35 and a gradation conforming to the following requirements:

<p>| Gradation of Sand for Pipe Bedding, Pipe Zone, and Asphalt Concrete |</p>
<table>
<thead>
<tr>
<th>Sieve</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>No 8</td>
<td>75 - 100</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 - 12</td>
</tr>
</tbody>
</table>

3. Washed Concrete Sand for concrete, mortar, grout, slurry, and other purposes shall conform to SSPWC Section 200-1.5.5 having minimum sand equivalent (SE) of 70 and a gradation conforming to the following requirements:

<p>| Gradation of Washed Concrete Sand for Concrete, Mortar, Grout, and Slurry |</p>
<table>
<thead>
<tr>
<th>Sieve</th>
<th>Concrete Percent Passing</th>
<th>Mortar, Grout, and Slurry Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0 - 10</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 - 5</td>
<td>0 - 5</td>
</tr>
</tbody>
</table>

C. Aggregate Base

1. Aggregate base material shall be State of California Department of Transportation Standard Specification Section 26-1.02A Class 2 aggregate base, 3/4-inch gradation.

2. Unless otherwise noted, processed miscellaneous base material conforming to Standard Specifications for Public Works Construction Section 200-2.5, fine gradation shall be an acceptable alternative aggregate base material.
D. On-site Select Fill Material:

1. On-site material shall be in accordance with Section 02 20 00.

E. Imported Fill Material

1. Imported Fill material shall be in accordance with Section 02 20 00.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

Cement-sand slurry materials and their mixing, placing, compacting and curing requirements are specified in this Section. Their use for trench backfill, foundation support, and similar purposes are specified in detail elsewhere in the Contract Documents. Engineer may order the use of fill materials for purposes other than those specified in other Sections if, in his/her opinion, such use is advisable.

1.02 SCOPE OF WORK

Furnish all labor, materials, equipment and incidental required and install cement-sand slurry as shown on the Drawings and as specified herein.

1.03 RELATED WORK

A. Trenching, Backfilling and Compaction are included in Section 02 22 00.

B. Asphalt Concrete Pavement and Base are included in Section 02 51 20.

1.04 SUBMITTALS

A. Submit to the Engineer in conformance with Section 01 32 19:

1. Test reports of all types of cement to be used showing chemical analysis and physical properties.

2. Test reports for sand including sieve analysis, physical properties, and sand equivalency.

3. Mix design from the cement-sand slurry producer.
PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement:

1. Unless otherwise specified, Portland Cement shall be conforming to ASTM C150, Type II with all optional characteristics listed in Table 2 of ASTM C150.

2. Unless otherwise specified, the minimum content of cement per cubic yard of cement-sand mix shall be as follows:

   a. Entire trench backfill from bottom of trench to bottom of pavement – 141 lbs. (“one and one-half sack”)
   b. Trench backfill – 94 lbs. (“one sack”)
   c. Pipe and conduit bedding and Pipe Zone – 188 lbs. (“two sack”)
   d. Void around concrete structures – 188 lbs. (“two sack”)
   e. Other applications – 188 lbs. (“two sack”)

B. Water shall be as specified in Section 03 30 00.

C. Sand shall consist of natural or manufactured granular materials free from frost, frozen lumps, organic material, mica, loam, clay and other deleterious substances. Sand shall conform to requirements of SSPWC Section 200-1.5, except as noted below. Sand shall have a minimum sand equivalent of 35, the percent passing No. 200 sieve shall not exceed 12 percent and the fines shall be non-plastic.

PART 3 - EXECUTION

3.01 MIXING

A. Mixing shall conform to the requirements of SSPWC Section 201-1.4, except as noted below.

B. The total elapsed time between addition of water at the batch plant and discharging the complete mix shall not exceed 120 minutes.

C. Cement, sand and water shall be mixed thoroughly by a machine. Hand mixing will not be allowed.

D. Unless otherwise specified, minimum content of cement shall be as per Paragraph 2.01.A.2.
3.02 PLACEMENT

A. Cement-sand slurry may be placed by chutes, conveyors, buckets, pumps or tremies depending upon the application and accessibility.

B. For trench backfill, cement-sand slurry shall be placed continuously. To contain cement-sand slurry when filling long open trenches or open-ended structures in stages, the end points shall be adequately bulkheaded to prevent movement. Methods may include bulkheading with sandbags, earth dams or forms.

C. Contractor shall take necessary measures as approved by the City to prevent floatation or displacement of pipe, conduit, and embedded items. Placing temporary sandbags, straps anchored to soil, lower slump cement-sand slurry or permanent concrete cap as approved by the City and recommended by the manufacturer of the item to be protected shall be used.

3.03 PLACEMENT OF BACKFILL MATERIAL AND PAVEMENT

Placement of backfill material, temporary asphalt paving, or permanent pavement over cement-sand slurry may be performed as soon as the surface will withstand the construction process without displacement or disruption and has become firm and unyielding.

END OF SECTION
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SECTION 02 40 00
SHEETING, SHORING AND BRACING

PART 1 - GENERAL

1.01 WORK OF THIS SECTION

A. Provide protective installation consisting of sheeting, shoring, bracing, piling, wales, lagging, anchorages and fastenings, or equivalent system, referred to as “support system” in this Section, for protection of workers, existing facilities and the Work.

B. This section is intended to be general in scope and is applicable to all work of this Contract, including principally the following items as may be required in the performance of the Work:

1. Trenches and excavation
2. Structural excavation
3. Protecting existing facilities, including aboveground structures and utilities below ground
4. Maintaining construction activities within City’s property and easement areas

C. Due to vibration and noise considerations, any types of impact hammer methods will not be allowed on the site.

1.02 RELATED WORK

A. Dewatering and Drainage are included in Section 02 14 00.

B. Earthwork is included in Section 02 20 00.

C. Trenching, Backfilling and Compaction are included in Section 02 22 00.

1.03 QUALITY ASSURANCE

A. Conform to the requirements of California Code of Regulations, Title 8, Division 1, Chapter 4.

B. Conform to the requirements of Section 6705, California Labor Code, Shoring and Bracing Drawings.
1.04 SUBMITTALS

A. Prior to commencing work involving the support system, the Contractor shall file with the Engineer for record, copies of herein specified design drawings and calculations. Submittals for the support system shall be submitted for record purposes only.

1. Submit layout plans, design drawings, and calculations for the proposed temporary and permanent (to be left in place) support systems.

2. Trench and excavation safety plan must meet the minimum requirements of the Cal/OSHA Construction Safety Orders Section 1539-1543.

B. Prior to commencing work, submit certificates of all certified "Competent Persons" who will have the responsibilities described in Paragraph 3.01H.

1.05 DESIGN REQUIREMENTS

A. The Contractor shall be solely responsible for the design of the support system.

B. The Contractor shall employ a California registered Civil or Structural Engineer to prepare, stamp seal, and sign design drawings and calculations for the support system.

C. Design shall be performed in accordance with the requirements of applicable codes, and regulations.

D. Support system requiring impact hammer method will not be allowed.

E. Design, installation and removal of support system shall be accomplished in such a manner as to maintain the required excavation or trench section and maintain the undisturbed state of the soils below and adjacent to the excavation.

F. All applicable dead, live, surcharge, dynamic, and construction loads shall be considered for the design of support system.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Use new or used materials complying with provisions of the approved support system design drawings. Materials shall be free from defects and damage that in any way might impair their protective function. Wood materials shall be pressure treated and be suitable for the application.
B. All steel components shall be galvanized and wood materials shall be pressure treated for support system to be left in place.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Furnish, install, monitor and maintain excavation support system (e.g., shoring, sheeting, bracing, piling, trench boxes, etc.) as required by federal, state or local laws, ordinances, regulations and safety requirements and as required to perform the work within excavation. Support the sides of excavation to prevent any movement that could in any way reduce the width of the excavation below that necessary for proper construction and protect adjacent structures from undermining, settlement or other damage. Take care to prevent the formation of voids outside of excavation supports. If voids do occur, immediately backfill and compact the voids with compacted common fill material or cement-sand slurry as approved by the City. Voids in locations that cannot be properly compacted upon backfilling shall be filled with lean concrete or cement-sand slurry as approved by the City.

B. Abut members to exclude groundwater and fines, preventing the erosion of voids outside the support system. In soft, wet ground, drive the support system to a lower level as excavation progresses so that the support system is embedded in undisturbed earth. Install supports at close intervals to prevent displacement of the surrounding earth and to maintain safe conditions in the work area. Any damage shall be the responsibility of the Contractor.

C. Install excavation supports outside the neat lines of foundations. Supports shall be plumb and securely braced and tied in position. Excavation support shall be adequate to withstand all pressures to which the supports will be subjected. Any movement or bulging of supports shall be corrected to provide the necessary clearances, dimensions and structural integrity.

D. Excavation supports shall be carefully installed and removed in such manner so as not to cause damage or endanger the work or other adjacent vehicular traffic, structures, utilities, or properties.

E. Withdraw individual members alternately as the backfill is raised, maintaining sufficient support system to protect the Work, workmen, adjacent structures, utilities or property.

F. All voids left or caused by withdrawal of supports shall be immediately filled with sand and compacted or filled with cement-sand slurry.
G. Excavation Supports Left in Place

1. Excavation supports may only be left in place where indicated on the Drawings or where unstable conditions occur in the underlying strata and withdrawal of supports will endanger the Work. If not shown on the Drawings, supports may only be left in place with the written approval of the City and agency having jurisdiction.

2. All wood members to be left in place shall be pressure treated with preservatives for ground contact. All steel members to be left in place shall be galvanized. Remove all wood within a zone extending four (4) feet below finished grade.

3. The right of the City or Engineer to direct that certain excavation supports remain in place shall not be construed as creating any obligation on the City or Engineer to give such direction, nor shall failure to give such direction relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient excavation supports to prevent any movement of the ground or damage to adjacent structures.

H. The Contractor shall at all time during excavation and installation and removal of the support system have a certified "Competent Person" on site to observe and direct the safe and proper installation of all work covered in this Section.

I. The Contractor shall install the support system as shown on his/her submitted calculations. No substitute members will be allowed unless submitted to the Engineer with supporting documents.

END OF SECTION
SECTION 02 51 20
PAVEMENT AND BASE

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide materials and installation of pavement and base as shown on the Drawings and as specified herein.

B. This section is intended to be general in scope and is applicable to all work of this Contract, including principally the following items as may be required in the performance of the Work:

1. Restoration of ground surface over trenches.

2. Restoration or addition of pavement disturbed by the Contractor during his course of work or as directed.

3. Installation of new asphalt concrete as specified in the Contract Documents.

4. Replacing existing pavement and aggregate base with new as specified in the Contract Documents.

5. Installing new concrete pavement and aggregate base as specified in the Contract Documents.

C. All streets surface improvements excavated or damaged by the Contractor shall be restored by him in accordance with the requirements of these Specifications and the agency having jurisdiction and shall be subject to inspection by the City and the agency having jurisdiction. All driveways and other facilities damaged by the Contractor and not under the jurisdiction of a public authority shall be repaired or replaced in kind by the Contractor.

1.02 RELATED WORK

A. Temporary Traffic Controls are included in Section 01 55 26.

B. Trenching, Backfilling and Compaction are included in Section 02 22 00.

C. Granular and Rock Materials are included in Section 02 23 00.

D. Cement-Sand Slurry is included in Section 02 25 00.
E. Slurry Seal is included in Section 02 51 30.

F. Pavement Striping and Markings are included in Section 02 52 00.

G. Concrete Work is included in Section 03 30 00.

1.03 REFERENCE DOCUMENTS


1.04 SUBMITTALS

A. Submit to the Engineer in conformance with Section 01 32 19:

1. Asphalt mix design. Mix design to comply with Section 39-1.03 “Hot Mix Asphalt Mix Design Requirements” of the State of California, Department of Transportation, and Caltrans Standard Specifications.

2. Concrete mix design

3. Gradation of aggregate material

4. Aggregate base material gradation

5. Submit a copy of a report from a testing laboratory performed in the last 6 months verifying that the material to be supplied conforms to the specified gradations or characteristics for asphalt concrete (emulsion, aggregate gradation and composition, mix design components) and verifying the gradation and material composition of the aggregate base rock in this section conforms to the specified requirements and that the material contains less than 1% asbestos by weight or volume.

6. Submit asphalt concrete tickets to the City at the time of delivery.

7. Submit concrete tickets to the City at the time of delivery.

1.05 PRODUCT HANDLING

A. Protection
1. Use all means necessary to protect bituminous concrete pavement materials before, during and after installation and to protect the installed work and materials of all other trades.

2. Paving materials delivered to the work site prior to placement shall be stockpiled in such a manner as to minimize surface water impact on the stockpile and minimize intrusion of soils adjacent to and beneath the stockpile.

B. Replacements

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the City.

1.06 TRAFFIC CONTROL

A. The Contractor shall prepare traffic control plans as required and submit to the City for approval. No work shall be performed until approval from the governing agency (City) is acquired.

B. The Contractor shall provide temporary traffic controls as required by the governing agency and in accordance with the Contract Documents.

C. Refer to Section 01 55 26 for additional requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aggregate Base:

1. Aggregate base shall be as per Section 02 23 00.

2. Unless otherwise shown on the Drawings or as required by the agency having jurisdiction, the minimum thickness of aggregate base shall be 6 inches.

B. Asphalt Concrete:

1. Asphalt concrete shall be 4” thick minimum.

2. Asphalt concrete shall be Type III-C2-PG 64-10 per Section 203-6 of the SSPWC with asphalt content between 5.5% and 6.5%.
3. Gradation of aggregate and asphalt content of the mix shall be such that smooth dense finished surface is produced.

C. Asphalt shall be PG 64-10 conforming to SSPWC 203-1.

D. Tack coat shall be Tack coat material shall be PG 64-16 in accordance with Section 302 of SSPWC.

E. Headers shall be 2-inch (nominal size) boards, the vertical dimension of which shall at least be equal to the thickness of the pavement at the header line, but not less than 6 inches. In lieu of 2-inch thick boards, double 1-inch thick board will be acceptable. Side stakes 2 inches by 3 inches (nominal size), 18 inches long or longer, and spaced not over 4 feet apart shall be driven on the outside of the headers to a depth of 1 inch below the top and then nailed to the header. The joints between the individual boards being used as headers shall be spliced with a 1-inch thick (nominal size) board of the same height as the header and not less than 24 inches long. Headers and stakes shall be redwood.

F. Slurry seal shall be per Section 02 51 30

G. Cement-sand slurry shall be per Section 02 25 00.

H. Concrete and reinforcement shall be per Section 03 30 00. Concrete pavement thickness and reinforcement layout shall be as shown on the drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Cutting or Breaking Paved Surfaces:

1. In cutting or breaking up street and roadway surfacing, including asphalt and concrete pavement, the Contractor shall not use equipment that will injure or endanger nearby improvements of any type.

2. All asphaltic concrete pavements and concrete gutters, driveways, curbs and sidewalks shall be saw cut. All pavement sawcuts shall be neat and straight to provide an unfractured and level pavement joint for bonding existing surfacing with pavement replacement. All cut edges shall provide clean, solid, vertical faces free from all loose material. Where large irregular surfaces are removed, such trimming or cutting as hereinafter provided, shall be parallel or at right angles to the road centerline.
3. All asphaltic concrete pavements and concrete gutters, driveways, curbs and sidewalks excavated or damaged shall be removed between neat vertical cuts made with a saw of approved type.

4. In the case of curbs, gutters and sidewalks, cuts shall be made at the nearest score marks beyond the damaged portion, as may be required in each case by the governing agency. In the event a joint or scoring line does not exist or that such joint is three feet or more from the removed or damaged portion, the existing concrete shall be removed and reconstructed to neat, plane faces.

5. All removed material including aggregate base and pavement shall be hauled away from the work site and legally disposed of by the Contractor.

B. Subgrade Preparation:

1. Before the surfacing or pavement is placed, a subgrade shall be constructed conforming to the grades and cross-sections shown in the Contract Documents. Perform required excavation and/or fill placement to establish elevations of subgrade. The finished subgrade shall be true to grade and cross-sections, hard, uniform, smooth, and shall be compacted to 95% relative density.

2. Where required, scarify and recompact subgrade. Unless otherwise noted, 4" of subgrade shall be scarified and re compacted to 95% relative density.

3. Where cement-sand slurry is specified or used as backfill for trench or excavation, it shall be extended up to bottom of the aggregate base.

C. Bituminous Tack Coat:

1. Tack coat material shall be PG 64-16.

2. Apply tack coat as follows:
   a. on existing asphalt at uniform rate of 0.15-gal/sq yd.
   b. on newly placed asphalt base courses at uniform rate of 0.05 to 0.10 gal/sq yd.
   c. on contact surfaces of curbs, gutters, and concrete slabs.
   d. In areas inaccessible to the spray bar on the applicator truck, SS-1h emulsion may be substituted and applied from a hand wand at a rate of 0.08 gallons per square yard.
3. All surfaces to receive tack coat shall be cleaned prior to application of tack coat.

4. The area to which tack coat has been applied shall be closed to public traffic. Care shall be taken to avoid tracking binder material onto adjacent surfaces. If the area is left unattended, then appropriate “fresh oil” signs must be posted. The Contractor shall be responsible for resolving all claims related to asphalt materials splashed/tracked on vehicles, concrete, and private property.

5. The Contractor shall be responsible for protecting existing storm drain catch inlets and to ensure that no tack coat spoils are sprayed into storm drain inlets.

D. Pavement Restoration – General:

1. In all existing pavement areas where the surface is removed, broken or damaged by equipment or in which the ground has caved in or settled due to the installation of the improvements, the surface shall be restored to the original grade by the Contractor.

2. The pavement to be restored by the Contractor shall include all classes and types of pavements whether in main roadways, shoulders, curbs, gutters, driveways or sidewalks.

3. Prior to resurfacing, the existing surfacing shall be removed as specified herein.

   a. In order to obtain a satisfactory junction with adjacent surfaces, the Contractor shall cut back and trim the edges to provide a clean, sound, and vertical joint.

   b. All broken and jagged edges of the pavement edge shall be sawed straight.

   c. Asphalt concrete pavement shall be saw cut to a minimum depth of 2 inches at a point not less than 18 inches outside the limits of excavation or the previous pavement cut (made by pneumatic tools), whichever limits are the greater.

   d. Where a trench edge is less than 4 feet from the existing edge of pavement, gutter, or curb, the remaining existing pavement shall be removed and replaced with new base course and pavement.

   e. Surfacing so cut shall be removed and disposed of by the Contractor prior to resurfacing.
4. Concrete Pavement Restoration:

   a. Install 6 inch-thick minimum aggregate base compacted to 95% over prepared sub-base and prior to placing concrete components.

   b. Install concrete flatwork and surfaces over prepared sub-base. Concrete flatwork shall be restored using concrete with 4000 psi minimum compressive strength. Thickness of concrete pavement shall be as shown on the drawings. If not shown on the drawings, concrete pavement thickness shall be equal to thickness of the existing concrete component, but not less than 5 inches. Replacement flatwork shall have the same pattern, texture, and appearance as the existing. Install #4 reinforcing bars at 12 inches on center in both directions in the middle of the concrete member.

   c. Restore concrete curb, gutter and ditches using concrete with 3000 psi minimum compressive strength. Sizes, dimensions, and configuration of replacement components shall be the same as existing. Install 4 x 4 W2.1/W2.1 welded wire mesh in the middle of concrete ditches.

   d. All restoration work shall be satisfactory to the City and the agency having jurisdiction.

5. Asphalt Concrete Restoration (Including Trench Surface Repair):

   a. Install 6-inch thick minimum aggregate base compacted to 95% over prepared sub-base and prior to placing asphalt concrete.

   b. Install redwood headers and stakes at all edges of new pavement, except at concrete curbs, gutters, sidewalks and other concrete structures. Material for headers and stakes shall be in accordance with Paragraph 2.01E.

   c. Apply prime/tack coat to in-place aggregate base.

   d. Apply tack coat on existing horizontal and vertical surfaces to come in contact with new asphalt pavement.

   e. Place and compact asphalt concrete to match original finished surface. The minimum extents of repair of disturbed pavement surfaces over trench shall comply with City of Thousand Oaks Standard Plate No. 8-14. New Asphalt shall be 1” thicker than existing, but not less than 4”.

   f. Install 2” grind and overlay as shown on City of Thousand Oaks Standard Plate No. 8-14.
g. Pavement adjacent to structures and in other areas inaccessible to heavy rollers shall be compacted by means of heated hand tools.

E. Removal of Existing and Installation of New Asphalt Concrete Pavement:

1. Remove existing asphalt concrete pavement, including asphalt concrete and aggregate base from areas shown on the Drawings. All removed materials shall be disposed of off the site.

2. Overexcavate as required or as shown on the Drawings to a depth to achieve specified finish grade with required thicknesses of aggregate base and asphalt concrete. Dispose of all unused excavated material.

3. Provide 95% compacted fill to bring the sub-base to desired elevation to achieve specified finish grade with required thicknesses of aggregate base and asphalt concrete.

4. The aggregate base compacted to 95% shall be placed on prepared sub-base.

5. Install concrete curb, gutter, ditches, cross gutters, etc. as shown on the Drawings or to replace existing.

6. An herbicide effective against native grasses and weeds of area shall be applied in the quantity and according to the methods recommended by the manufacturer.

7. Install redwood headers and stakes at all edges of new pavement, except at concrete curbs, gutters, sidewalks and other concrete structures. Material for headers and stakes shall be in accordance with Paragraph 2.01E.

8. Apply tack coat on existing horizontal and vertical surfaces to come in contact with new asphalt pavement.

9. Place asphalt concrete of required thickness as specified herein.

10. Pavement adjacent to structures and in other areas inaccessible to heavy rollers shall be compacted by means of heated hand tools.

11. All manholes, valve boxes and other surface structures shall be brought to match the grade of new paved surfaces, as required.

F. Installation of New Asphalt Concrete Pavement:
1. The aggregate base compacted to 95% shall be placed on prepared sub-base.

2. Install concrete curb, gutter, ditches, cross gutters, etc. as shown on the Drawings.

3. An herbicide effective against native grasses and weeds of area shall be applied in the quantity and according to the methods recommended by the manufacturer.

4. Install redwood headers and stakes at all edges of new pavement, except at concrete curbs, gutters, sidewalks and other concrete structures. Material for headers and stakes shall be in accordance with Paragraph 2.01E.

5. Apply tack coat on existing horizontal and vertical surfaces to come in contact with new asphalt pavement.

6. Place asphalt concrete of required thickness as specified herein.

7. Pavement adjacent to structures and in other areas inaccessible to heavy rollers shall be compacted by means of heated hand tools.

8. All manholes, valve boxes and other surface structures shall be brought to match the grade of new paved surfaces, as required.

G. Installation of New Concrete Pavement:

1. Where shown on Drawings or required, remove existing pavement, including asphalt concrete, concrete, and aggregate base. All removed materials shall be disposed of off the site.

2. Overexcavate as required or as shown on the Drawings to a depth to achieve specified finish grade with required thicknesses of aggregate base and concrete. Dispose of all unused excavated material.

3. Provide 95% compacted fill to bring the sub-base to desired elevation to achieve specified finish grade with required thicknesses of aggregate base and concrete.

4. The aggregate base compacted to 95% shall be placed on prepared sub-base.

5. Install concrete curb, gutter, ditches, cross gutters, etc. as shown on the Drawings.
6. An herbicide effective against native grasses and weeds of area shall be applied in the quantity and according to the methods recommended by the manufacturer.

7. Install flexible joint material of required thickness (1/2" minimum unless otherwise shown) between vertical concrete surfaces to come in contact with new concrete pavement.

8. Place concrete pavement and reinforcement as shown on the Drawings.

9. Provide transverse and longitudinal control joints as shown on Drawings.

10. Concrete finish shall be broom finish in direction of drainage path.

11. All manholes, valve boxes and other surface structures shall be brought to match the grade of new paved surfaces, as required.

H. Clean-up

1. During the work, all roads, public and private, shall be kept clean and neat. Any debris, rubbish, unused materials or equipment shall be expeditiously removed.

3.02 DETECTORS

The Contractor shall replace all detectors removed or damaged as a part of the Work. Cost for equipment and installation shall be included in the Contract prices for the Work and no extra compensation will be made to the Contractor.

3.03 MAINTENANCE OF SURFACE

A. Following the certification of completion by the City, the Contractor shall maintain the surface of the re-paved and new pavement areas for a least the period of the guarantee of the Work.

B. All materials and labor required for the maintenance of paving shall be supplied by the Contractor and the work shall be done in a manner satisfactory to the City.

3.04 PAVEMENT STRIPING AND MARKINGS

Pavement striping and marking shall be in accordance with Section 02 52 00.
SECTION 02 51 30
SLURRY SEAL

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and install emulsion-aggregate slurry seal – Type I as shown on the Drawings, as specified herein, and as required to accommodate new construction.

1.02 RELATED WORK

A. Pavement and Base are included in Section 02 51 20.
B. Pavement Striping and Markings are included in Section 02 52 00
C. Temporary Traffic Control is included in Section 13 52 00.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01 32 19, the following.
   1. Detailed product data
   2. Slurry seal mix design. Mix design shall be certified by a laboratory in accordance with ASTM D 3910 procedures per (GREENBOOK) 203-5.2.
   3. Slurry application instructions and methods

1.04 REFERENCE STANDARDS


1.05 NOTIFICATION

A. The Contractor shall inform and notify the City and all affected property owners at least forty-eight hours in advance by letter of the intention to place slurry seal.
B. At a minimum, all residences listed below shall be notified.
   1. North Conejo School Road north of E. Hillcrest Drive.
2. Twin Oaks Ct.

3. Ranch View Place.

4. Mountain Crest Circle.

5. Rye Ct.

6. Any other street that connects to North Conejo School Rd north of E. Hillcrest Drive.

C. Refer to Section 01 11 00 Summary of Work for additional notification requirements.

1.06 TRAFFIC CONTROL

A. The Contractor shall prepare traffic control plans as required and submit to the City for approval. No work shall be performed until approval from the governing agency (City) is acquired.

B. The Contractor shall provide temporary traffic controls as required by the governing agency and in accordance with the Contract Documents.

C. Refer to Section 01 55 26 for additional requirements.

PART 2 - PRODUCTS

2.01 EMULSION-AGGREGATE SLURRY SEAL

A. Emulsion-aggregate slurry seal (EAS) shall be a stable mixture of cationic emulsified asphalt, aggregate, water and a set control agent and is herein referred to as slurry. EAS shall be in accordance with the 2018 Standard Specifications for Public Works Construction (GREENBOOK) Sections 203-5 and 302-4, except as modified and supplemented herein.

B. Emulsified asphalt shall be cationic quick-set type CQS-1h conforming to (GREENBOOK) 203-3.

C. The additives for quick and slow-setting emulsion and the asphalt modifier shall be included as required. The amount of additive and asphalt modifier to be included in the quickset slurry shall be the amount necessary to ensure that the applied slurry can support vehicular traffic within 60 minutes after the last application.
D. Water shall be clean, domestic portable water. See Temporary Utilities Specification 01 51 00, Section 1.03 Water Supply for more details.

E. Aggregate shall be rock dust or other mineral aggregates conforming to the requirements of (GREENBOOK), Section 200 – Rock Materials.

F. The Contractor shall submit for approval a complete mix design. Mix design shall be certified by a laboratory in accordance with ASTM D 3910 procedures per (GREENBOOK) 203-5.2.

PART 3 - EXECUTION

3.01 PREPARATION

A. The Contractor shall complete repairs to the asphalt as required prior to application of slurry.

B. The Contractor shall vacuum sweep all pavement surfaces immediately prior to the application of asphaltic materials to provide clean surfaces.

C. Surfaces shall be dry.

3.02 APPLICATION OF SLURRY SEAL

A. Slurry seal shall be placed on pavement where shown on the Drawings and as required to complete the work. Limits shown on the Drawings are minimum.

B. Slurry seal shall not be applied prior to 8:30 am.

C. The work shall consist of mixing emulsion, aggregate, additive, and water and spreading the mixture on the pavement where shown on contract plans. Type I slurry shall be applied at the application rate shown in Table 302-4.6.4.1.

<table>
<thead>
<tr>
<th>Aggregate Type</th>
<th>Aggregate Application Rate</th>
</tr>
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<tr>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>Type I</td>
<td>8 lbs/yd² (4.3 kg/m²)</td>
</tr>
</tbody>
</table>

D. The slurry must be mixed and spread uniformly; evidence of a wash boarding effect in the finished slurry seal will be cause for removal and/or repair of the slurry seal. Slurry shall be applied in such a manner that no ridges shall remain.

E. The slurry shall be placed so that it will present a neat appearance along edge of concrete gutters.
F. In order to prevent cold longitudinal joints, such joints shall be completed within 1 hour of the first pass. Only transverse joints will remain open for the next work day application.

G. Slurry Seal shall be placed only when the ambient temperature is 50 degrees and rising. No Slurry will be placed during the threat of inclement weather. No slurry seal shall be placed on a wet surface.

H. The maximum speed of the slurry machine shall not exceed 270 feet per minute.

I. The completed slurry seal shall leave a homogeneous mat, adhere firmly to the prepared surface, and a skid-resistant surface texture throughout its service life.

J. The Contractor shall exercise care to prevent the slurry from being deposited on surfaces not designated to be sealed, i.e. concrete gutters, cross-gutters, etc. The Contractor shall remove slurry from those surfaces not designated to be sealed. The method used to remove slurry must be approved by the Engineer’s Field Representative.

K. Evidence of solidification of the asphalt, balling or lumping of the aggregates or the presence of un-coated aggregates will be cause for rejection of the slurry.

L. Where the completed slurry is not uniform in color, the pavement shall be treated to eliminate the color variation at the Contractor’s expense. The method of treatment shall be approved by the Engineer.

3.03 FINISHING AND SWEEPING

A. Loose aggregate remaining after the slurry seal has set shall be swept up and disposed of the day after it was placed.

B. All streets shall be re-swept two weeks after the completion of the slurry seal to remove any loose aggregate.

3.04 REPAIRS AND PATCHING

A. The Contractor shall be responsible for the repair of the slurry seal not meeting the requirements of these specifications as deemed necessary by the Engineer’s Field Representative. This will include such items as tire tracks, improperly mixed slurry etc.

B. Contractor shall reapply slurry seal to the nonconforming area to meet the requirements at the Contractors expense.

END OF SECTION
SECTION 02 52 50

PAVEMENT STRIPING AND MARKINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and install pavement striping and markings.

1.02 RELATED WORK

A. Temporary Traffic Controls are included in Section 01 55 26.

B. Pavement and Base are included in Section 02 51 20.

C. Slurry Seal is included in Section 02 51 30.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01 32 19, completely detailed product data and manufacturer’s instructions for products to be installed.

B. Drawing documenting location, length, type, and color of all street striping and markings. Drawing shall be sufficiently accurate to replace all existing striping and markings in kind.

C. Proof of traffic striping applicator’s minimum required experience.

D. Temporary traffic control plans and related permits.

1.04 REFERENCE STANDARDS

A. All Traffic striping and legend paint shall conform to the City of Thousand Oaks Road Standards (State Standard Specification Section 84, 85, 86). Paint shall comply with Federal Highway Administration specifications per 23 CRF Part 655.

B. Pavement Markers: Material and workmanship shall conform to the requirements of Section 85 “Pavement Markers” of the California Department of Transportation (Caltrans) Standard Specifications.

C. Glass Beads: Material and workmanship shall conform to the requirements of Caltrans.
1.05 QUALITY ASSURANCE

A. Documentation of all existing traffic striping to be disturbed by the Contractor shall be photographed and videoed prior to commencement of work. All pictures and videos shall be adequate to show the color, type and extent of all striping that will be disturbed by the Contractor. All pictures and videos shall be submitted to the Engineer within two weeks after capture and prior to start of work, whichever is earlier.

B. Traffic striping and pavement marking shall be performed by a qualified technician having a minimum of five (5) years’ practical experience and successful history in performing such work.

1.06 NOTIFICATION

A. The Contractor shall notify the City at least 7 days prior to start of striping and markings.

B. For placement of striping, the Contractor shall notify the City for inspection after completion of layout of traffic striping and pavement markings prior to the application of paint.

PART 2 - PRODUCTS

2.01 MATERIAL

A. Thermoplastic Striping and Marking: Thermoplastic striping and marking material used for permanent pavement striping and marking shall be 100 percent solid thermoplastic in accordance with Section 84, "Traffic Stripes and Pavement Markings," of the Caltrans Standard Specifications and as additionally required under these Specifications.

B. Paint Striping and Markings: Paint striping and marking material used for permanent pavement striping and marking shall be in accordance with Section 84, "Traffic Stripes and Pavement Markings," of the Caltrans Standard Specifications and as additionally required under these Specifications.


D. Temporary Pavement Striping and Marking Paint: Temporary pavement striping and marking paint shall be latex based and one of the following or approved equivalent:


3. Sherwin Williams: Set fast acrylic water borne traffic marking paint.

E. Colors:

1. Text: White

2. Lane Delineators, Street Dividers: White or Yellow

3. No Parking Zone Markings: Yellow

4. No Parking Curb: Red

5. Directional Arrows: White

F. Glass Beads: Glass beads shall conform to the requirements of California State Specifications 8010-004, Type II.

G. Raised Pavement Markers: Manufactured in accordance with Caltrans Standard Plans and Specifications. All Raised Pavements Markers (RPM) shall be Reflective and of the appropriate color. Certificates of compliance shall be furnished for pavement markers.

H. Flexible reflective temporary raised pavement markers (TRPM) shall be as manufactured by Davidson Plastics Company, or approved equal.

**PART 3 - EXECUTION**

**3.01 COORDINATION**

A. The Contractor shall coordinate approval of all striping with the City prior to executing all striping work. At the discretion of the City’s Project Representative Field Representative, “cat-tracking” may be required prior to approval.

B. The Contractor shall coordinate all work with utilities to avoid conflicts with utilities work including trash/refuse pickup.

C. Notify the City per Paragraph 1.06.
D. The Contractor shall submit traffic control plans to the City for review and approval. No work shall be performed until traffic control plans are approved by the City.

E. The Contractor shall coordinate striping operations as specified in the “Summary of Work” and in other specifications herein.

3.02 DOCUMENT EXISTING CONDITION

The Contractor shall document existing job condition in field prior to removal of existing striping and markings per Paragraph 1.05.

3.03 TEMPORARY STRIPING AND PAVEMENT MARKINGS

A. The Contractor shall, upon obliterating existing pavement striping, immediately place temporary striping and/or markings along the lines of the existing striping to direct traffic until permanent striping or markers can be placed. This includes placement of raised markers on all steel plates or other trench coverings, as required.

B. All temporary striping and markers layout shall be as approved by the City. Approval of the City shall be obtained before placing pavement markers and striping.

C. Install temporary traffic controls as approved by the City.

D. Paint used for temporary pavement striping shall be performed when pavement is clean and thoroughly dry, and precipitation is not expected within 12 hours of completion of application.

E. Contractor shall be responsible for removal of all temporary striping and markers prior to final pavement repairs and restoration, and application of final permanent striping and markers.

3.04 PERMANENT STRIPING AND MARKINGS

A. Traffic striping and pavement marking shall be performed to replace all striping and markings that are disturbed, removed, or stained beyond restoration due to construction.

B. The Contractor shall perform all layout, alignment, and spotting, and their completeness and accuracy. Traffic striping shall not vary more than 1/2 inch in 50 feet from the alignment shown on the plans.

C. All striping, pavement markings and legends shall be installed within 48 hours
after the street/trench repairs are completed, except as noted. Pavement markers, including striping, shall not be placed on new asphalt concrete surfacing, slurry seal or fog seal until the surfacing or seal coat has been opened to public traffic for a period of not less than 7 Calendar Days when hot melt bituminous adhesive is used and not less than 14 Calendar Days when epoxy adhesive is used

D. Install temporary traffic controls as approved by the City.

E. Prior to striping application pavement surface must be clean and thoroughly dry. Remove dirt, oil, grease, and other materials that may affect adhesion.

F. Pavement striping and markings application procedures shall comply with manufacturer’s recommendations and applicable requirements of the City and governmental agencies having jurisdiction, including airborne emissions and industrial waste disposal requirements. Apply all striping with specifically designed and manufactured equipment for pavement striping and marking providing uniform straight edges without overspray.

G. Permanent paving striping and symbols shall match existing.

H. Apply permanent traffic control striping and marking, including, but not limited to, stripes, directional arrows, cross walks and lettering and handicap striping and symbols as indicated on the Drawings and in accordance with local governing agency standards. Use stencils for arrows, lettering, and symbols.

I. Paint Striping and Marking

1. Minimum application rate for painted striping and marking shall be in accordance with Section 84-3.05 of the Caltrans Standard Specifications. Black paint may be placed in one coat. All other paints shall be placed in two coats.

2. Paint shall be placed when the atmospheric temperature is above 50 degrees Fahrenheit during placement and during anticipated drying period and in accordance with manufacturer’s recommendation. Paint shall not be placed if paint may be damaged by rain, condensation, or other such water damage whatever the source during the anticipated drying period.

3. For painted surfaces, apply masonry conditioner on weathered or sandblasted surfaces, bricks, or stucco. Apply paint at package consistency.

J. Thermoplastic Paint

1. Restoration of all damaged or removed thermoplastic striping or legends
shall be in accordance with Section 84-2, “Thermoplastic Traffic Stripes and Pavement Markings”.

2. Thermoplastic striping shall be applied within 48 hours after asphalt concrete construction.

3. Minimum thermoplastic striping thickness is 0.06 inches and minimum marking thickness shall be 0.100 inches to 0.150 inches.

4. Thermoplastic shall be placed when the pavement surface temperature is between 61 degrees and 129 degrees Fahrenheit and in accordance with manufacturer’s recommendation. Thermoplastic shall not be placed if rain is anticipated within 24 hours of placement.

K. Glass Beads:

1. Glass beads for thermoplastic striping and marking shall be placed at a rate of not less than 8 pounds per 100 square feet.

2. Glass beads for painted striping and marking shall be placed following placement of the second coat of paint at rate of 5 pounds per gallon of paint.

L. Apply raised pavement markers in accordance with Caltrans Standard Plans and Specifications.

3.05 CLEANING

A. During the work all access road, public and private, shall be kept clean and neat. Any debris, rubbish, unused materials, or loose rock shall be removed daily.

B. Special care shall be taken to avoid discoloration of or material splashing on existing surfaces, including driveways, drainage ditches, curbs and gutters. The Contractor will be responsible for the removal of such discoloration, material overspray and splashes at the Contractor's sole expense.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish labor, materials, equipment, appurtenances, accessories, and incidentals required and install steel pole for mounting lights and cameras (in future by others) as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Concrete Work is included in Division 3.
B. Electrical General Provisions are included in Section 16 00 00.
C. Electrical Switchboard and MCC are included in Section 16 60 00.
D. Control Cabinet and Controls are included in Section 16 90 00.

1.03 REFERENCE DOCUMENTS

A. American Society for Testing and Materials (ASTM)
   1. ASTM A36 - Standard Specification for Carbon Structural Steel
   2. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   3. ASTM A575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades

B. AASHTO

1.04 SUBMITTALS

A. Submit the following to the Engineer in accordance with Section 01 32 19.
   1. Manufacturer’s product data and installation instructions, including catalogue cuts and drawings showing dimensions, details, and profiles,
product components, and accessories. These products shall include pole, pole base plate, anchors, hand hole, brackets, tenon, clamps, hardware, etc.

2. Painting and coating data.

1.05 DELIVERY, STORAGE & HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact in accordance with Section 01 65 00.

B. Do not store poles on ground. Support poles so they are at least one foot above ground level and growing vegetation. Do not remove factory-applied pole wrappings until just before installing pole.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Poles shall be as shown on the Drawings and as specified herein. All material shall be new and unused.

B. Pole shall be designed for 100 mph wind velocity plus 30% gust factor per AASHTO Standard Specifications for Structural Support for Highway Signs, Luminaries and Traffic Signals.

C. Pole shall have the following features:

1. Height: 18 feet high and 14 feet high as specified on Drawings.
2. 5" diameter
3. Made from 0.179" thick minimum steel
4. Round straight cross section
5. One-piece construction
6. Gasketed 3"x5" hand hole shall be provided approximately 12" above the base of the base
7. Two-piece square base cover
8. Pole cap
9. Galvanized anchor bolts; lengths shall not be less than shown on the Drawings
10. Galvanized hardware, including nuts and washers
11. TGIC thermoset polyester powder coating with 3.0 mil thickness minimum. Color shall be dark bronze.

D. Pole shall be Series RSS-18-50 and RSS14-50 as manufactured by Hubbell or approved equal meeting specified requirements.
E. Each pole shall be provided with brackets for mounting two outdoor LED lights with stainless steel hardware. Finish and color shall match those of the pole.

F. Light fixtures shall be as shown on the Drawings and provided under Division 16.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Coordinate with the City to determine exact location of each pole.

B. Comply with the manufacturer’s instructions and recommendations for pole installation and as required on the Drawings.

C. Remove the protective wrapping from the pole, being careful not to cut or scratch the pole surface.

D. While the pole is easily accessible, install accessories and thread the wiring between the installed devices and the hand hole.

E. Install underground cables and pull the wiring out through the handhole in accordance with Section 16 05 00. Push the wiring into the pole and install the hand hole cover.

F. Concrete foundation shall be constructed in accordance with the requirements shown on the Drawings and as specified in Section 03 30 00.

G. Anchor bolts shall be installed as shown on the Drawings.

H. Install lights on supports/brackets in accordance with manufacturer's instructions.

END OF SECTION
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PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, material, tools, equipment and incidentals required to furnish, install and test all steel pipe and fittings as shown on the Drawings, as specified herein, and as required to complete the work.

1.02 RELATED WORK

A. Temporary Traffic Controls are included in Section 01 55 26.
B. Trenching, Backfilling and Compaction are included in Section 02 22 00.
C. Granular and Rock Materials are included in Section 02 23 00.
D. Water Pipeline Testing and Disinfection are included in Section 02 66 00.
E. Shop Coating is included in Section 09 91 00.
F. Field Painting and Protective Coating are included in Section 09 92 00.
G. Petrolatum Tape and Petroleum Wax Tape Coatings are included in Section 09 93 00.

1.03 SUBMITTALS

A. General:

1. Submit to the Engineer, in accordance with Section 01 32 19, supplier information, shop drawings, certifications, test reports, and evidence of qualifications as specified herein.

2. Do not submit pipe shop drawings until potholing has been completed, the pothole report has been favorably reviewed by the Engineer, and the Shop Drawings incorporate actual field conditions as determined through potholing.

B. Shop Drawings:
1. Line Layout Information: Line layout that indicate the specific number of each pipe and fitting, locations of pipe pieces, fittings, loose flanges, buttstraps, outlets, test bulkheads, and similar components, pipe pieces with extra length for field adjustment, invert elevations, etc.

2. Pipe Material and Fabrication Information:
   a. Dimensional drawings of all pipe pieces, fittings, and appurtenances.
   b. Joint and pipe/fitting wall construction details that indicate the type and thickness of steel pipe wall, and all other pertinent information required for the manufacture of the product.
   c. Detail drawings of each type of joints.
   d. Thicknesses of mortar lining and coating.
   e. Shop applied primer or protective coating including color, minimum dry film thickness and manufacturer’s data sheet.

3. Welding Information:
   a. Full and complete information regarding location, type, size, material method, and extent of all welds shall be shown on the shop drawings. The shop drawings shall distinguish between shop and field welds and shall identify welds which merit special welding sequences or techniques.
   b. Written welding procedures for shop and field weld, including Welding Procedure Specifications and Procedure Qualifications Records. Welding procedures used to fabricate pipe shall be qualified by testing under the provisions of ANSI/AWS D1.1 – Structural Welding Code – Steel.

C. Factory and Field Test Results:
   1. Submit all factory test results.
   2. Submit all field test results.

1.04 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO)
   1. Standard Specification for Highway Bridges

B. American Society for Testing and Materials (ASTM)
1. ASTM A36 - Standard Specification for Carbon Structural Steel

2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

3. ASTM A139 - Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and over)

4. ASTM A234 - Standard Specification for Pipe Fittings for Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperature Service

5. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates

6. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

7. ASTM A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength


10. ASTM E165 - Standard Practice for Liquid Penetrant Testing for General Industry

11. ASTM E709 - Standard Guide for Magnetic Particle Testing

C. American Water Works Association (AWWA)

1. AWWA C200 - Steel Water Pipe, 6 In. (150mm) and Larger

2. AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe 4 In. (100mm) and Larger - Shop Applied

3. AWWA C206 - Field Welding of Steel Water Pipe

4. AWWA C207 - Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100mm Through 3,600mm)

5. AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings
6. AWWA C210 - Liquid Epoxy Coatings and Linings for Steel Water Pipe and Fittings

7. AWWA M11 - Steel Pipe - A Guide for Design and Installation

D. American National Standards Institute (ANSI)

1. ANSI/ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250

2. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through 24

E. American Welding Society (AWS)

1. AWS D1.1 - Structural Welding Code - Steel

1.05 QUALITY ASSURANCE

A. Pipe Manufacturer/Fabricator: The manufacturer or fabricator of the pipe and fittings shall have five (5) years’ minimum experience in fabricating pipe and fittings of similar diameter and wall thicknesses required for the Work and shall have the manufacturing capability to meet the schedule requirements of this project.

B. The manufacturer is responsible for the performance of all inspection requirements as specified in AWWA C200, C205, C206 and C208.

C. All welding procedures used to fabricate and install pipe shall be in accordance with the ANSI/AWS D1.1. All final passes of all manual welds shall be liquid penetrant tested as specified in AWS D1.1.

D. All welding shall be done by skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local, approved testing agency not more than 12 months prior to commencing work on the pipeline.

E. Welding shall conform to AWWA C-200 and AWS D1.1.

F. Contractor shall be responsible for compatibility between any flanges furnished by the Contractor and vendors, and for flanges on existing pipe or valves. Any misalignment between flanges shall be corrected by the Contractor at no additional cost to the City.
PART 2 - PRODUCTS

2.01 GENERAL

A. Steel pipe, fittings and appurtenances shall conform to applicable AWWA standards and the supplemental requirements specified herein.

B. The pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing and roughness.

C. Closures and connecting pieces shall be provided as required to compensate for different headings in the pipe laying operation and to adjust the pipe laying.

D. Extra pipe length and buttstraps shall be provided as required to make field adjustment and connections.

2.02 PIPE MATERIALS AND FABRICATION

A. Schedule Steel Pipe: Schedule Steel Pipe shall conform to ASTM A53 (Type E or S). Unless otherwise specified noted on the Drawings, schedule steel pipe shall be Schedule 40. Schedule steel pipe shall be produced in accordance with ASTM requirements and be subject to AWWA C200 quality control procedures.

B. Fabricated Steel Pipe, Specials and Fittings: Steel pipe shall be fabricated from steel sheets, plates or coils in accordance with AWWA C200, Section 4. The steel plates shall conform to ASTM A36 or ASTM A283 Grade C or D or ASTM A572 Grade 42. The steel sheet shall conform to the requirements of ASTM A570 Grade 33 or 36. Design stress for cement mortar coated pipe shall be limited to 50 percent of the yield or 16,500 psi, whichever is less.

C. Pipe Length:

1. Pipe shall be furnished principally in 40-foot or 50-foot maximum net laying lengths with special lengths as required by plan and profile for location of elbows, tees, etc. or as required for installation. Shorter pipe lengths shall be provided as required on the Drawings.

2. Unless otherwise noted minimum 8” extra pipe length shall be provided for field adjustment at each buttstrap connection and loose flanges to be welded in field.

D. Pipe Joints/Ends:

1. The pipe joints shall be in accordance with the requirements specified herein and shown on the Drawings.
2. Pipe shall have required type of ends and shall be cut, beveled and formed, as required, to provide joints as shown on the Drawings or required to complete the work. Welded field joints shall be provided as shown on the Drawings or as required.

3. For curved alignment requiring greater angular deflections at the joints than permitted for square end pipe by the limitations specified herein, bell ends only of pipe sections may be beveled a maximum of 5 degrees.

E. Coating:

1. All steel pipes to be installed below ground shall be mortar coated. The mortar coating shall be extended through the walls and slabs and 3" minimum beyond. Mortar coating shall be as specified in this Section.

2. All buried ferrous materials excluding stainless steel, including flanges, bolts and others with no mortar coating shall be wrapped with petrolatum tape or petroleum wax tape in accordance with Section 09 93 00.

3. All steel pipes to be installed above ground and where indicated on the drawings shall be painted in accordance with Sections 09 91 00 and 09 92 00, except those portions with mortar coating.

F. Lining:

1. Unless otherwise shown on the Drawings all steel pipes shall be mortar lined. Mortar lining shall be as specified in this Section.

2. Where indicated on the Drawings, the interior of pipes shall be epoxy lined in accordance with Sections 09 91 00 and 09 92 00.

2.03 FITTINGS MATERIALS AND FABRICATION

A. Material and Fabrication Standards: Fittings shall comply with the following:

1. Threaded Steel Fittings: ASTM A47, ASTM A197 or ANSI B16.3

2. Forged Steel Fittings: ASTM A234, ASTM A105 or ANSI B16.11

3. Fabricated Steel Fittings and Specials: AWWA C200 and AWWA C208 and as supplemented herein

4. Grooved Fittings: Full-flow cast fittings, or segmentally welded fittings with groves or shoulders designed and fabricated for standard grooved-end piping
B. Fabricated Fittings:

1. Fittings and specials shall be fabricated in accordance with AWWA C200, Section 4, and modified as noted herein, including non-destructive testing by dye penetrant of welds not previously tested in the straight pipe. Fittings shall conform to the dimensions of AWWA C208 and modified as noted herein, or may be fabricated into standard pipe lengths.

2. Fabricated elbows 22-1/2 degrees and smaller shall be two piece, greater than 22-1/2 degrees to 45 degrees shall be three piece, greater than 45 degrees to 67-1/2 degrees shall be four piece and greater than 67-1/2 degrees to 90 degrees shall be five piece. All tees, laterals and outlets shall be reinforced in accordance with the Drawings. Fittings and specials not detailed on the Drawings shall be submitted to the Engineer for review and shall conform to the details furnished by the manufacturer as allowed or approved by the City.

3. Reinforcement for wyes, tees, outlets, and nozzles shall be designed in accordance with the Drawings. Reinforcement shall be designed for the pressure indicated and shall be in accordance with the Standard Drawings, where applicable.

4. In lieu of saddle or wrapper reinforcement as required by the design procedure shown, pipe or specials with outlets may be fabricated in their entirety of steel plate having a thickness equal to the sum of the pipe wall plus the required reinforcement.

5. Access manholes with covers shall be as indicated. All threaded outlets shall be forged steel suitable for 3000 psi service.

C. Fitting Joints/Ends:

1. Fitting and specials shall have the required type of ends and shall be cut, beveled, formed to the required shapes to provide joints as shown on the Drawings or as required.

2. Unless otherwise shown ends of all fittings and specials shall be prepared to provide restrained joints, including welded, flanged, grooved or other types as shown on the Drawings.

D. Coating: Coatings for fittings and specials shall be as specified for the straight pipe. Fittings that are indicated or required to be left uncoated shall be field painted as required in Sections 09 91 00 and 09 92 00.
E. Lining:

1. Fittings and specials shall have the same lining as the adjoining pipe.

2. Specials and fittings that cannot be mechanically lined shall be lined by hand-application, using the same materials as are used for the pipe and in accordance with the applicable AWWA C602 Standards. Lining applied in this manner shall provide protection equal to that indicated for the pipe. Fittings may be fabricated from pipe that has been mechanically lined. Areas of lining that have been damaged by such fabrication shall be repaired by hand-applications in accordance with applicable AWWA C602 Standards.

2.04 JOINTS

A. General:

1. Unless otherwise shown, the standard field joints for steel pipe shall be either a single-welded lap joint or butt welded.

2. Mechanically coupled or flanged joints shall be required where shown on the Drawings.

3. Butt-strap joints shall be used where required for field closure and where shown on the Drawings.

4. The joints furnished shall have the same or higher pressure rating as abutting pipe.

B. Lap Joints:

1. Lap joints prepared for field welding shall be in accordance with ANSI/AWWA C200.

2. Form the bell on an expanding press or by being thrust axially over a die in such a manner as to stretch the steel plate beyond its elastic limit to form a round bell of required diameter and shape, avoiding injurious reduction in plate thickness at any point, and avoiding impairment of the physical properties of any part of the plate. No process will be permitted in which the bell is formed by rolling.

3. The angular deflection at lap welded field joints in square end pipe shall not exceed a pull of 3/4-inch and the spigot shall have a minimum penetration of 3/4-inch in the bell.

C. Butt Joints:
1. Butt joints prepared for field welding shall be in accordance with ANSI/AWWA C200.

2. Ends of pipe shall be beveled to an angle of 30 degrees. Root width shall be 1/16 inch.

2.05 CEMENT MORTAR COATING AND LINING

A. Materials:

1. Mortar for coating and lining shall be composed of one part cement, not more than three parts of aggregate and water.

2. Cement for mortar shall conform to ASTM C-150 and shall be Type II or Type V. Fly ash or pozzolan shall not be used as a cement replacement unless otherwise specified.

3. Aggregates for mortar shall conform to ASTM C205, ASTM C-33 and Section 201-1.2.2 of the Standard Specifications.

4. Water for mortar shall conform to the quality requirements of Section 201-1.2.3 of the Standard Specifications.

5. Admixtures reducing water requirements or controlling set may be used in accordance with AWWA C205. The Contractor shall submit for approval in writing any proposed admixture.

B. Lining Application:

1. Interior surfaces of all steel pipe, fittings, and specials shall be cleaned and lined in the shop with cement mortar lining applied centrifugally in conformity with AWWA C205. If special cannot be lined centrifugally, it shall be lined by hand in accordance with AWWA C602.

2. Unless otherwise shown on the Drawings the minimum lining thickness shall be as follows, with a tolerance of plus or minus 20 percent:

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter (inches)</th>
<th>Lining Thickness (inches)</th>
</tr>
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<tbody>
<tr>
<td>3-5</td>
<td>1/4</td>
</tr>
<tr>
<td>6-12</td>
<td>5/16</td>
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<tr>
<td>13-16</td>
<td>3/8</td>
</tr>
<tr>
<td>17-24</td>
<td>1/2</td>
</tr>
<tr>
<td>over 24</td>
<td>3/4</td>
</tr>
</tbody>
</table>

3. Fittings and specials larger than 24 inches in diameter and not fabricated from centrifugally formed straight sections, shall require 2-inch by 4-inch WO.5 x WO.5 gage self-furring wire mesh reinforcement for hand-applied...
mortar lining. The wire mesh shall be positioned approximately in the center of the lining. The wire spaced 2 inches on center shall run circumferentially around the pipe with the fabric securely fastened to the pipe. Splices shall be lapped 4 inches and the free ends tied or looped to assure continuity.

4. After factory curing of the cement mortar lining and coating, the cement mortar lining of pipe and fittings shall be kept continually moist during storage, including storage at the site, by wrapping the ends with a plastic membrane and addition of water as needed.

5. The lining material shall be installed in one continuous operation. Any deficiencies must be immediately removed, and the lining cut back to a square shoulder and replaced full thickness. Lining patchwork along feather edged joints shall not be permitted.

6. The progress of the application of mortar lining shall be regulated in order that all hand work, including the repair of defective areas is cured in accordance with the applicable provisions of AWWA C200 and C205. Cement-mortar for patching shall be the same materials as the mortar for machine lining, except that a finer grading of sand and mortar richer in cement shall be used when field inspection indicates that such mix will improve the finished lining for the pipe.

7. The pipe shall be left bare where field joints occur as indicated. Ends of the linings shall be left square and uniform. Feathered or uneven edges will not be permitted. Lining system shall be continuous to the spigot end of the pipe and shall be cut back sufficiently from the bell end to permit field installation. All holdback areas shall be thoroughly cleaned and given a shop coat of rust-inhibitive primer.

8. During the lining operation and thereafter, the pipe shall be maintained in a round condition by bracing or strutting as specified herein. The lining machines shall be of a type that has been used successfully for similar work. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found faulty at delivery site, the damaged or unsatisfactory portions shall be replaced with lining conforming to these Specifications at no additional cost to the City.

9. For all pipe and fittings with plant-applied cement mortar linings, the Contractor shall provide a polyethylene or other suitable bulkhead on the ends of the pipe and on all special openings to prevent drying out of the lining. All bulkheads shall be substantial enough to remain intact during shipping and storage until the pipe is installed.

10. Defective linings, as determined by the City, shall be removed from the pipe wall and shall be replaced to the full thickness required. Defective lining shall be cut back to a square shoulder in order to avoid feather edged joints. Temperature and shrinkage cracks in the mortar less than 1/16-inch
wide need not be repaired. Pipes, specials and fittings with cracks wider than 1/16 inch shall be rejected.

C. Coating Application:

1. Where applicable in accordance with this Section, exterior surfaces of steel pipe, fittings, and specials shall be cleaned, and mortar coated in the shop and in accordance with AWWA C205.

2. Unless otherwise shown on the Drawings the minimum coating thickness shall be as follows, with a tolerance of plus or minus 20 percent:

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter (inches)</th>
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<td>13-24</td>
<td>1</td>
</tr>
<tr>
<td>over 24</td>
<td>1 1/4</td>
</tr>
</tbody>
</table>

3. In lieu of gunite, a cement mortar coating may be applied by mechanical means, either by feeding the mortar between two tangents and counter-rotating brushes or by casting or extruding the mortar in such a manner as to provide a dense and uniform coating. The finished coating shall be free from deleterious flaws, honey combing, or injurious imperfections.

4. Mortar coating shall have a spiral wire reinforcement or welded wire fabric or ribbon mesh reinforcement in accordance with AWWA C205. The welded wire fabric shall be securely fastened to the pipe with welded clips or strips of steel. The wire spaced 2 inches on center shall extend circumferentially around the pipe. The ends of reinforcement strips shall be lapped 4-inches and the free ends tied or looped to assure continuity of the reinforcement.

5. Coating system shall be continuous to the bell end of the pipe and shall be cut back sufficiently from the spigot end to permit field installation. Cement mortar coating “holdbacks” shall be provided at couplings, harness assemblies, joints for welding and tape wrapping, etc. as necessary for the proper assembly and installation of piping, valves, accessories, and other equipment specified or indicated. Contractor shall arrange for, and pipe manufacturer shall provide, coating holdbacks consistent with this requirement and the Contractor’s proposed methods. All holdback areas shall be thoroughly cleaned and given a shop coat of rust-inhibitive primer.

6. After coating has been placed, it shall be cured in accordance with AWWA C205.

7. Defective coatings, as determined by the City, shall be removed from the pipe wall and shall be replaced to the full thickness required. Defective coating shall be cut back to a square shoulder in order to avoid feather
edged joints. Temperature and shrinkage cracks in the mortar less than 1/16-inch wide need not be repaired. Pipes, specials and fittings with cracks wider than 1/16 inch shall be rejected.

2.06 MISCELLANEOUS MATERIALS

Miscellaneous materials indicated on the Drawings or otherwise required for proper completion of the work shall be provided whether or not specifically set forth herein, and each item so provided shall be of high quality and shall be subject to rejection when, in the opinion of the Engineer, it fails to meet overall standards of quality and workmanship intended for the project. Such items shall include, but are not limited to, gratings, vents, valve boxes, valve and pipe supports, ladders, hangers, bolts, nuts, clamps and fasteners.

PART 3 - EXECUTION

3.01 HANDLING PIPE AND FITTINGS

A. Pipe shall be transported from the plant to the work site on padded bunks with nylon tie-down straps or padded banding to adequately protect the pipe and coating.

B. Pipe shall be carefully handled, stored and shipped in a manner that will prevent damage to the coating and lining. Pipe shall be handled with wide double belt slings with spreader bar or rubber padded forklifts. Chains, cables or other equipment likely to cause damage to the pipe or coating shall not be used.

C. No metal tools or heavy objects shall be permitted to come into contact unnecessarily with the finished coatings and linings. All pipe, fittings, specials and couplings shall be examined before laying and no piece shall be installed that is found to be defective. Any damage to the coatings and linings shall be repaired as acceptable to the City.

D. If any pipe is found to be defective after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner by the Contractor, at his/her own expense.

E. Pipe shall not be placed directly on rough ground. Stored pipe shall be supported at all times on sawdust bags, sand bags, or other suitable support. Supports shall be of sufficient size to prevent contact of the pipe coating with the ground or any other obstruction. Rolling the pipe on the ground will not be permitted.

F. While being laid, the pipe shall not be rolled, skidded, or otherwise moved, when it contacts the ground at any point.
G. Each section of pipe, including bends and special fittings, shall be protected from undue deformation during handling, transportation and installation by proper internal bracing as required.
3.02 INSTALLATION OF PIPE AND FITTINGS

A. Except as otherwise specified herein, pipe and fittings shall be installed in accordance with the requirements of AWWA M11.

B. Inspection and Repair Prior to Installation:

1. The Contractor shall inspect each pipe and fitting to ensure that there are no damaged portions, including coating and lining prior to installation. The Contractor shall permit and aid the City’s representative in the inspection of the coating and linings of the pipe prior to installation.

2. Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance.

3. The Contractor shall repair any damage before lowering the pipe into the trench to the satisfaction of the City. The pipe or fitting which cannot be repaired, as determined by the City, shall be removed from the site and replaced with a new in kind.

C. Trenching and Bedding:

1. Trenching shall be in accordance with Section 02 22 00.

2. As soon as the excavation is completed to the bottom of the excavation, the bedding material shall be placed and firmly compacted in accordance with Section 02 22 00. The pipe shall be firmly bedded in the bedding material to conform to the line and grade indicated on the Drawings. Blocking under the pipe will not be permitted.

D. Laying - General:

1. Each section of pipe and fitting shall be laid in the order and position shown on the laying schedule. The pipe shall be laid to the set line and grade, within approximately 1 inch plus or minus. The intent is to lay to grade on grades of zero slope. Good alignment shall be preserved in laying. The method of jointing the pipe shall be in strict accordance with the manufacturer's instructions and as supplemented herein. Under ordinary conditions of laying, pipe shall be laid with bell ends upstream, unless otherwise approved by the City.

2. Except for short runs, which may be permitted by the City, pipes shall be laid uphill on grades exceeding 10 percent. Pipe that is laid on a downhill grade shall be blocked and held in place until sufficient support is furnished by the following pipe to prevent movement. All bends shall be properly installed as shown on the Drawings.
3. The deflections at joints shall not exceed the lesser of those recommended by the manufacturer and as specified herein. Fittings, in addition to those shown on the Drawings, shall be provided as required.

4. Where necessary to raise or lower the pipe due to unforeseen obstructions or other causes, the City may change the alignment or the grades. Such change shall be made by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. However, in no case shall the deflection in the joint exceed the maximum deflection as specified in this Section.

5. No joint shall be misfit any amount which will be detrimental to the strength and water tightness of the finished joint. In all cases, the joint opening, before finishing with the protective mortar inside the pipe, shall be the controlling factor.

6. The Contractor shall excavate holes in the trench as required for coating exterior surfaces at joints, and spaces sufficient to permit removal of the slings without damage to the pipe coating.

7. Have on hand a sufficient supply of assorted short pipe lengths, adaptors, buttstraps, loose flanges, and any other fittings necessary to prevent delays in pipe laying.

8. Unless otherwise shown, all joints shall be restrained. Restraining shall be as indicated and shall be by restrained split-sleeve couplings, shouldered or grooved couplings, flanges or field welding. If not indicated on the drawings, it shall be welded.

9. When laying of pipe is not in progress, the open ends of the pipe shall be protected with suitable bulkheads to maintain moist atmosphere and prevent unauthorized access by persons, animals, water or any undesirable substance.

10. Completely clean the interior of the pipe of all dirt, sand, mortar splatter and any other debris following completion of pipe laying and necessary repairs before testing and disinfecting the completed pipeline.

3.03 FIELD WELDED JOINTS

A. Field welded joints shall be provided at locations shown on the Drawings and as required by the City. Field welded joints shall be in accordance with AWWA C206 and AWS D1.1 requirements, and the following. The Contractor shall provide ventilation during welding and joint mortaring operations in conformance with Cal/OSHA construction safety orders Sections 1532 and 1536.
B. Where exterior welds are performed, adequate space shall be provided for welding and inspection of the joints.

C. All welding procedures used to install pipe shall be prequalified under provisions of AWS D1.1. Welding procedures shall be required for field attachments and field welded joints.

D. Prior to the beginning of the welding procedure, any tack welds used to position the pipe during laying shall be removed. Any annular space between the laying surfaces of the bell and spigot shall be equally distributed around the circumference of the joint by shimming, jacking, or other suitable means.

E. During welding, a qualified welding foreman shall be on site at all times.

F. Unless double fillet welds are indicated, field welded lap joints may, at the Contractor’s option, be made on either the inside or the outside of the pipe.

G. Welding shall be done by the Shielded Metal Arc Weld (SMAW) method or the FCAW-G method. Welders and welding procedures shall be qualified by testing in accordance with AWS D1.1 requirements. No radiographic examination of test plates shall be accepted. Allowable welding variables shall be as follows.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>SMAW</td>
<td>5/32 inch</td>
<td>2.5 x Electrode Diameter</td>
<td>1/8 inch</td>
</tr>
<tr>
<td>FCAW-G</td>
<td>5/64 inch</td>
<td>1/2 inch</td>
<td>1/8 inch</td>
</tr>
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SMAW shall be applied by means of continuous stringer beads or a weave pattern. The electrode used on the root pass shall be E-6010 down. The remaining passes shall be E-7018 up.

FCAW-G shall utilize an external shielding gas in accordance with AWS A5.20, Table 2, and the electrode and pipe manufacturer’s recommendations. FCAW-G will be applied by means of continuous stringer beads run uphill.

H. For butt-welded joints, align pipe faces to the tolerances specified by AWS D1.1. Upon completion of the interior weld, remove backing bar except for pipe installed in casing pipes. Upon removal of the backing bar, gouge out the exterior of the joint to sound metal. Secure a clean surface to deposit weld metal, and complete exterior weld passes as necessary to fuse smoothly the
plate surfaces. Grind smooth the weld metal to match the profile of adjacent pipe surfaces.

All completed butt-welded joints shall be 100% tested by the radiograph testing procedures. Use an approved independent testing company to perform all radiograph tests. Maintain records of tests performed and results of each test for each location. Testing of welds shall be done in the presence of the City.

I. Install welded butt straps as shown on the Drawings and as required to make field connections as approved by the Engineer.

J. After the pipe and pipe joint are properly positioned in the trench, the length of pipe between joints shall be backfilled to at least one foot above the top of the pipe. Care shall be exercised during the initial backfilling to prevent movement of the pipe and to prevent any backfill material from being deposited on the joint.

K. To control temperature stresses, the unbackfilled joint areas of the pipe shall be shaded from the direct rays of the sun by the use of properly supported awnings, umbrellas, tarpaulins, or other suitable materials for a minimum period of two hours prior to the beginning of the welding operation and until the weld has been completed. Shading materials at the joint area shall not rest directly on the pipe, but shall be supported to allow air circulation around the pipe. Shading of the pipe joints need not be performed when the ambient air temperature is below 45 degrees F.

L. Weld Quality and Inspection:

1. All welded joints shall be of a type that will produce complete fusion of the plates and shall be free from unsound metals, pinholes, and cracks. The finish of welded joints shall be reasonably smooth and free from grooves, depressions, burrs, and other irregularities, and there shall be no valley or undercut in the center or edges of the weld.

2. As soon as practicable after the welding of each joint, all field-welded joints shall be examined and tested by an independent qualified testing company hired by the Contractor and as approved by the City. Tests shall include the following at a minimum:

   a. Visually inspect all welds for quality and completeness. Standards for acceptance for visual inspection shall be in accordance with AWWA C206 and ANSI/AWS D1.1 requirements.

   b. Perform dye penetration testing of all welded joints. Use a certified Level II NDT technician. Dye penetrant tests shall be made per Section 02 66 00.
3. All defects shall be removed, rewelded and retested. Upon retest, the repaired area shall show no cracks, leaks or other defects.

4. Submit all results to the Engineer for review.

5. Contractor shall be responsible for all costs of inspection and testing.

3.04 JOINT COATING AND LINING

A. General:

1. All exterior joint recesses shall be filled with grout and all interior joint recesses shall be filled (lined) with stiff mortar.

2. Prior placing joint coating or lining, the interior and exterior joint recesses shall be thoroughly wiped clean and all water, loose scale, dirt and other foreign material shall be removed.

3. The cement for joint grout and mortar shall be Portland cement conforming to ASTM C150 and shall be of the same type used for the pipe coating and lining, unless otherwise approved by the City.

B. Joint Coating (Grout Bands):

1. After laying, the exterior joint recess of cement mortar coated pipe shall be filled with grout, unless shown otherwise in the details. Exterior joint recesses of cement mortar coated steel pipe and joint recesses of specials, fittings and appurtenance piping for steel pipe shall be filled with grout.

2. Grout used for filling the outside joints by the pouring method shall be mixed in proportions of 1 part cement, by weight, to not more than 2 parts, by weight, of sand passing a No. 16 mesh screen and thoroughly mixed with water to the consistency of rich cream.

3. A cloth band 9 inches wide shall be placed around the outside of the pipe and centered over the joint. The joint band shall be bound to the pipe by use of steel box strapping. The band shall completely and snugly encase the joint except for an opening at the top through which to pour the grout. The outside grout space, prior to filling with grout, shall be flushed with water so that the surfaces of the joint to be in contact with the grout filling will be thoroughly moistened when the grout is poured.

4. Fluid grout shall be poured in only one opening in this joint and pouring shall be continuous until grout appears at the other side. The grout shall be rodded on both sides of the pipe, if necessary, to settle the grout and more grout added to fill the joint completely. The bands shall not be removed from the joint, and exposed portions of the joint, after filling, shall be covered with wet burlap or moist earth.
5. Unless otherwise approved, quick setting mortar shall be used for pipe reach to be installed within public streets. For quick setting mortar, use Quick-Setting Cement #1240 as supplied by Quikrete Companies.
C. Joint Lining:

1. The inside joint recess shall be mortared. The lining in both the bell and spigot ends shall be dampened prior to application of the mortar.

2. Mortar for the inside of pipe joints shall be mixed in the portion of not richer than 1 part, by weight, of cement to 1 part, by weight, of clean well-graded sand; and not leaner than 1 part, by weight, of cement to 2 parts, by weight, of clean, well-graded sand, and just sufficient water to obtain the proper consistency. To improve workability of the mortar, the Contractor, with the City’s approval, may replace not more than 7 percent, by weight, of cement with hydrated lime or replace not more than 30 percent, by weight, of cement with approved pozzolan, or may add an approved air-entraining agent in the mortar, or may use any combinations of these. A stiff mortar shall be placed on the shoulder of the bell. The joint shall then be closed.

3. Any mortar that has become so stiff that proper placement without retempering cannot be assured shall be wasted. The Contractor shall prepare the mortar in small batches to avoid stiffening of the mortar prior to its application. The finished joint shall be smooth and flush with the adjacent pipe surfaces.

4. Where a quick setting mortar is required, Quikrete Companies, Quick-Setting Cement #1240 may be used. All other parts of product use shall be per manufacturer’s recommendations, except that the pipe may be placed in service after 24-hour damp cure. Unless otherwise approved, quick setting mortar shall be used for pipe reach to be installed within public streets.

5. Pointing of joints for pipe 30 inches and larger shall be by hand from inside the pipe. Pointing of joints for pipe less than 30 inches in diameter shall be from handholes or a rubber sewer ball or squeegee shall be pulled through the pipe to remove excess mortar extruded on the inside surface of the pipe.

6. Where bends and other fittings in the smaller diameter pipe preclude the use of balls or squeegees, detail fabrication and assembly drawings to minimize the need for hand holes to finish interior mortar joints. Provide hand holes or buttstrap with hand hole closures as necessary to hand point all interior mortar joints not finished otherwise.

3.05 EPOXY COATING REPAIR

A. All epoxy coating removed or damaged during welding of joints shall be repaired. The repair work shall include the following at a minimum:

1. Remove all loose paint material, grease, oil, and foreign material using approved solvents, wire brushing, grinding, and/or sanding.
2. All metal welds, imperfections, etc. shall be ground and sanded smooth.

3. Prepare steel surfaces using SSPC-SP2 or SSPC-SP3.

4. Apply two coats minimum of epoxy paint per Section 09 92 00.

3.06 INSTALLATION OF PIPE APPURTENANCES

A. Installation of Valves:

1. All valves shall be handled in a manner to prevent any injury or damage to any part of the valve.

2. All joints shall be thoroughly cleaned and prepared prior to installation. The Contractor shall adjust all stem packing and operate each valve prior to installation to insure proper operation.

3. All valves shall be installed so that the valve stems are plumb and in the location shown.

4. All buried valves shall be coated and protected in accordance with Sections 09 91 00, 09 92 00 and 09 93 00.

B. Installation of Flanged Joints:

1. Before flanged joints are assembled, the flange faces shall be thoroughly cleaned of all foreign material with a power wire brush. The gasket shall be centered and the connecting flanges drawn up watertight without unnecessarily stressing the flanges. All bolts shall be tightened in a progressive diametrically opposite sequence and torqued with a suitable, approved and calibrated torque wrench. All clamping torque shall be applied to the nuts only.

2. All buried flanges shall be coated and protected in accordance with Section 09 93 00.

C. Insulated Joints:

1. Insulated joints and appurtenant features shall be installed and constructed by the Contractor as shown on the Drawings. The Contractor shall exercise special care when installing these joints to prevent electrical conductivity across the joint.

2. Install insulating flanged joints at all exposed valves in vaults, buildings, manholes, and as shown on the Drawings.
3. Clean all insulating components of the insulating flanged gasket set of all dirt, grease, oil, and other foreign materials immediately prior to assembly. Align bolt holes in mating flanges at the time bolts and insulating sleeves are inserted to prevent damage to the insulation. After flange bolts have been tightened, inspect each insulating washer for cracks or other damage. Replace all damaged washers.

4. Refer to Section 02 66 00 for electrical continuity testing requirements.

3.07 CROSSING AND RELOCATING EXISTING UTILITIES

A. Locate and pothole existing utilities that may interfere with construction and provide City with a potholing report.

B. Contractor shall notify in writing all Utility Companies well in advance of construction of potential crossing or conflict with construction.

C. Perform work required in crossing culverts, water courses, including brooks and drainage ditches, storm drains, gas mains, water mains, electric, telephone, gas and water services and other utilities. This work shall include bracing, utility support, hand excavation, backfill and any other work required for crossing the utility or obstruction.

D. In locations where existing utilities cannot be crossed without interfering with the construction of the work as shown on the Drawings, remove and relocate the utility as directed by the City or cooperate with the utility companies concerned if they relocate their own utility.

E. At utility crossings and where designated by the City, firmly support the existing utility for its entire exposed length.

3.08 CLEANING

A. At the conclusion of the laying and prior to testing, thoroughly clean all of the new pipelines by spraying with water or other means to remove all dirt, stones, wood struts, pieces of wood or other material which may have entered during the construction period. Debris cleaned from the lines shall be removed at pipe ends. If, after this cleaning, obstructions remain, they shall be removed.

B. After the pipelines are cleaned and if the groundwater level is above the pipe or following a heavy rain, the City will examine the pipe for leaks. If defective pipes or joints are discovered at this time, they shall be repaired or replaced.

3.09 CHLORINATION AND TESTING OF PIPELINES

Chlorination of the pipelines used for potable water shall be as specified in Section 02 66 00.
3.10 SITE RESTORATION

A. Backfill and compaction shall be performed in accordance with Section 02 22 00.

B. Pavement repair shall be performed in accordance with Section 02 51 20.

END OF SECTION
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SECTION 02 63 00
SMALL DIAMETER PVC PIPE AND FITTINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install polyvinyl chloride (PVC) piping and appurtenances 12 inches and smaller as specified in the Contract Documents and as required to interconnect all piping for a complete and operable system.

B. PVC pipe and fittings shall be pressure rated and installed using gasketed joints, unless otherwise specified.

1.02 RELATED WORK

A. Temporary Traffic Controls are included in Section 01 55 26.

B. Trenching, Backfilling and Compaction are included in Section 02 22 00.

C. Pipe Appurtenances are included in Section 02 64 40.

D. Concrete Work is included in Division 3.

1.03 SUBMITTALS

A. General:

1. Submit to the Engineer, in accordance with Section 01 32 19, Shop Drawings and product data.

2. Do not submit pipe shop drawings until potholing has been completed, the pothole report has been favorably reviewed by the Engineer, and the Shop Drawings incorporate actual field conditions as determined through potholing.

B. Shop Drawings and product data shall be submitted to the Engineer and shall include the following:

1. Material data, material standards, grade of material, and dimensions and all other pertinent technical specifications for pipe, fittings, elbows, appurtenances, and pertinent items to be installed.
2. Piping layout, locations of valves, if any, and appurtenances, joint details, methods and locations of supports, anchorage, for all piping to be furnished.

3. Manufacturer’s data and information required for the complete piping systems and components.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)


2. ASTM D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

3. ASTM D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping

4. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products


6. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

B. American Water Works Association (AWWA)

1. AWWA C104 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water

2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems

3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings

4. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings

5. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution
6. AWWA M23 - PVC Pipe – Design and Installation
C. Plastic Pipe Institute (PPI)

1. PPI TR-3 – Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Pressure Design Basis (PDB), Strength Design Basis (SDB), Minimum Required Strength (MRS) Ratings, and Categorized Required Strength (CRS) for Thermoplastic Piping Materials or Pipe.

D. Underwriters Laboratories

1. UL 1285 - Pipe and Couplings, Polyvinyl Chloride (PVC), and Oriented Polyvinyl Chloride (PVCO) for Underground Fire Service

1.05 QUALITY ASSURANCE

A. All plastic pipe and fittings of each type shall be furnished by a single manufacturer who is experienced in the manufacture of the items to be furnished.

B. It shall not be a requirement that the pipe and fittings be manufactured by the same manufacturer, provided the pipe and fittings are compatible in joint configuration and size. The pipe and fittings shall be designed, constructed and installed in accordance with the best practices and methods and shall be suitable for the intended service.

C. Pipe inside and outside walls shall be smooth and free of surface abnormalities. Pipe and fitting shall be visually checked for defects and the presence of defects shall be cause to reject the damaged item.

D. Each pipe production run shall meet or exceed the test requirements for materials, workmanship, burst pressure, flattening and extrusion quality defined in AWWA C900 and as specified herein.

1.06 DELIVERY AND HANDLING

A. Marking

1. Pipe and fittings shall have markings that will remain legible after normal handling, storage and installation. The markings shall be printed indelibly in ink or molded thereon in a manner that will not reduce the strength of any component.

2. Markings on straight lengths of pipe shall include all those required under AWWA C900, excepting that the testing seal for potable-water service is not required. Markings shall include, at a minimum, the following:

   a. Pipe designation (PVC)
b. Nominal diameter and dimension ratio

c. Pressure rating and manufacturing standard (AWWA C900)

d. Manufacturer’s name or trademark

e. Marking on spigot end for depth of stab

B. Delivery, Handling and Storing

1. All pipe and fittings shall, unless otherwise specified, be prepared for standard commercial shipment. Plastic pipe shall be transported in a vehicle having a bed long enough to provide support for the full length of the pipe. Any length of pipe or fitting that has been damaged or distorted shall be replaced.

2. Care shall be exercised in handling, loading, unloading and storing pipe to avoid distortion, scratches, gouges, dents and in particular, scuffing of the ends. All plastic pipe shall be stored under cover in a flat, horizontal position, and protected from the sun and all elements until ready for installation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Poly Vinyl Chloride (PVC) Pipe and Fittings

1. PVC Pipe and fabricated fittings shall be pressure rated and manufactured from PVC compounds meeting ASTM D1784, Class 12454-B and shall qualify for a design basis of 4,000 psi at 73.4 degrees Fahrenheit per the requirements of PPI TR-3.

2. All PVC pipe and fittings shall be minimum Class 235, with a minimum dimension ratio of 18 unless otherwise shown as having a higher-pressure class or lower dimension ratio on the Drawings.

3. PVC pipe shall meet the requirements of AWWA C-900, UL 1285 (regardless of installed service type) and as additionally required in these Contract Documents.

4. Joints: Bell-end pipe designed for making PVC joints using elastomeric gaskets to affect the pressure seal shall meet requirements of ASTM D3139.
5. Gaskets and lubricants: Gaskets and lubricants for PVC pipe and fittings shall be made from materials that are compatible with the pipe and with each other.

6. Elastomeric gaskets: One gasket shall be furnished with each bell end of pipe and end of coupling. Elastomeric gasket shall meet the requirements of ASTM F477.

7. The pipe shall be manufactured in the USA or Canada by an ISO 9001 certified manufacturer.

8. All pipe shall be stored indoors or covered and protected from ultraviolet light after production at the manufacturing site until shipped from the factory. Pipe that appears sunburned or faded will be rejected.

9. PVC pipe shall be manufactured in strict accordance to the requirements of ASTM D2122 for physical dimensions and tolerances.

B. Ductile Iron Fittings

1. Fittings shall be fabricated from ductile iron in accordance with AWWA C110. All fittings shall be rated for 250 PSI. This standard covers all, but is not limited to fittings with combination of ends, including mechanical joints, plain end, flange, and push joint. The fitting types are elbows, tees, crosses, reducers, caps, and as shown on the Drawings.

2. Ductile-iron compact fittings, per AWWA C153, are not allowed.

3. Unless otherwise approved, the internal surfaces shall be lined with a uniform thickness of cement mortar and then sealed with a bituminous coating in accordance with AWWA C104.

4. The outside surface of ductile iron fittings shall be protected with polyethylene encasement furnished and installed in accordance with AWWA C105.

C. Whenever unions are called out on the Drawings, flanged connections may be substituted if dimensional controls do not preclude the use of flanges.

D. Fire hydrant laterals shall be Class 235 or greater PVC pipe.

E. Restrained Couplings: Restrained couplings shall be in accordance with Section 02 64 20.

PART 3 - EXECUTION
3.01 PVC PIPE AND DUCTILE IRON FITTING INSTALLATION

A. The installation of PVC pipe shall be strictly in accordance with the manufacturer's technical data and printed installation instructions, AWWA C605, and as specified herein. Where differences are found, the strictest requirement shall apply.

B. Laying and jointing of pipe shall conform to AWWA C605, except as specifically modified or supplemented herein. Pipe shall be on a prepared bed as indicated on the Drawings.

C. Rubber Gasket Joints shall be used for coupling sections of pipe and for making connections to fittings. Rubber gaskets and the design of the fittings used in the joints shall be such as to produce water-tightness for the conveyance of water at pressures shown on the Drawings.

D. Laying PVC Pipe

1. The pipe, including fittings for pipelines, shall be laid to the line and grades shown on the Drawings or as ordered. Departure from and return to established alignment and grades shall not exceed 1/16 inch per foot of pipe with a total of not more than 1 inch departure.

2. Pipe shall be installed in a predominantly uphill direction.

3. Cast iron or ductile iron pipe fittings shall be used as required to provide correct outlets, changes in direction, and size transitions.

4. Long radius curves may be constructed by bending of the pipe. No deflection at the joints will be allowed. The minimum radius shall be the larger of 350 times the nominal diameter of the pipe or as recommended by the pipe manufacturer. Contractor shall be responsible for any adjustments in alignment which may be necessary if the pipe manufacturer’s minimum radius is greater than 350 times the nominal diameter of the pipe.

5. When PVC pipe is in place and before backfilling, the pipe detection system shall be installed as indicated on the Drawings.

E. Install concrete thrust and support blocks at all ductile iron fittings where there is a change in direction, valve, pipeline dead ends and where indicated in the Contract Documents.

F. Care shall be taken to not mix mechanical and flange joint ends since they will not mate.
G. Install 14 gauge insulated solid core copper tracing wire on top of piping system and through the valve box. Secure tracing wire using approved tapes. Refer to City’s Standard Plate No. 33-1 for additional requirements.

H. Backfill material and backfilling of pipe trenches shall be performed as shown on the Drawings. Backfill material shall be placed carefully on each side of the pipe simultaneously in such manner as to prevent disturbing or damaging the pipe joints.

I. Connection with valves shall be made using flange adapters.

J. The Contractor shall take necessary measures to avoid floating of pipe.

K. Restrained Couplings/Joints:
   1. Provide restrained joints as shown on the Drawings and as required to restrain piping system.
   2. Restrained couplings shall be installed in accordance with manufacturer’s instructions.
   3. Restrained couplings shall be in accordance with Section 02 64 40.

3.02 CROSSING AND RELOCATING EXISTING UTILITIES

A. Perform all work required in crossing existing utilities or obstruction. This work shall include bracing, hand excavation, backfill and any other work required for crossing the utility or obstruction.

B. At pipe crossings and where designated by the City, firmly support the existing utility or pipe for its entire exposed length

3.03 CLEANING AND TESTING

Pipes shall be cleaned, flushed disinfected and tested prior to placing in operation in accordance with Section 02 66 00.

END OF SECTION
SECTION 02 64 20
SMALL VALVES AND PIPES

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment, appurtenances and incidentals required for small valves and pipes 3 inches and smaller, complete as specified herein and as shown on the Drawings, and as required to complete the Work.

1.02 SUBMITTALS

Submit to the Engineer, in accordance with Section 01 32 19, a list of materials to be furnished, equipment data and details, instruction manuals, and names of the suppliers.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
   2. ASTM B62 – Standard Specification for Composition Bronze or Ounce Metal Castings
   3. ASTM B88 – Standard Specification for Seamless Copper Water Tube

B. American Society of Mechanical Engineers (ASME)
   1. B1.20.1 – Pipe Threads, General Purpose
   2. B16.22 – Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
   3. B16.24 – Cast Copper Alloy Pipe Flanges, Flanged Fittings, and Valves
   4. B16.26 – Cast Copper Alloy Fittings for Flared Copper Tubes

C. United States Department of Defense (USDoD)
   1. A-A-59326 – Coupling Halves, Quick Disconnect, Cam-Locking Type
PART 2 - PRODUCTS

2.01 MATERIALS

A. Small Valves. Small valves 3 inches in diameter and smaller, unless otherwise specified on Drawings, shall conform to the following:

1. Ball Valve shall have brass 2-piece body, full port, 600 psi minimum pressure rating, chrome-plated solid brass ball, lever handle, adjustable stem packing gland, and PTFE seat. Ends shall be suitable for threaded connections as required. Ball valve shall be as manufactured by Watts, NIBCO, or approved equivalent.

2. Check Valves shall be bronze swing check valves with threaded connections NIBCO Model No. T-433 or an approved equivalent.

B. Copper Tubing. Copper tubing shall conform to the following requirements:

1. Buried Service – For buried service, copper tubing shall be of the I.D. sizes indicated, Type K, soft temper conforming to the requirements of ASTM B88. Fittings shall be flared type conforming to ASME B16.26. Compression type connection will be acceptable.

2. Exposed Service – Copper tubing in vaults and other exposed service shall be Type L, hard temper conforming to ASTM B88. Connection shall be made with soldered “sweat” type fittings, conforming to ASME B16.22 using lead-free 95-5 tin-antimony or lead-free 96-4 tin-silver solder. Compression type connection will be acceptable.

C. Brass Pipe, Nipples and Fittings – Brass pipe, nipple, and fittings shall be extra strong and conforming to ASTM B43. Ends shall be threaded or compression type as required.

D. Bronze Fittings – Bronze fittings shall be extra strong and conforming to ASTM B62. Ends shall be threaded or compression type as required.

E. Bushings. Threaded bushings shall be provided to isolate dissimilar metals from direct contact with each other. Bushings used shall meet the requirements for potable water service and all other requirements specified herein. Whether shown or not on the Drawings or Standards, bushings shall be provided at no additional cost to the City.

F. Quick-Connect Couplings. Quick connect couplings shall be of the cam and groove type consisting of a male adapter conforming to USDoD Specification
A-A59326. Male adapters shall be 316 stainless steel and designed to receive a
female coupler without requiring threading, bolting, or tools. Connections shall
remain tight and leakproof under pressures up to 300 psig. Each adapter shall
be furnished with a dust cap complete with an 18-inch long security chain of
corrosion resistant material. Coupling shall be as manufactured by Dover
Corporation, Ever-tite, or approved equal.

G. Supports and clamps for piping system shall be stainless steel or copper epoxy
coated with stainless steel hardware.

H. All piping, tubing, elbows, valves, couplings, appurtenances, and associated
items shall be rated for 250 psi working pressure minimum. Higher pressure
rating shall be provided where indicated or required.

**PART 3 - EXECUTION**

**3.01 INSTALLATION AND TESTING**

A. Install valves and pipes as shown on the Drawings, as recommended by the
manufacturer, and as required to complete the Work.

B. All piping, valves, and appurtenances shall be adequately and firmly supported.

C. Exposed valves and specials shall be installed true and plumb as indicated.

D. Provide valve drains and appurtenances as indicated and as required.

E. Test all valves for their proper operations in the presence of the City.

**END OF SECTION**
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SECTION 02 64 40

PIPE APPURTEANCES

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, material, tools, equipment and incidentals required to furnish, install and test pipe appurtenances as shown on the Drawings, as specified herein and as required to complete the work.

1.02 RELATED WORK

A. Shop Coating is included in Section 09 91 00.

B. Field Painting and Protective Coating are included in Section 09 92 00.

C. Petrolatum Tape and Petroleum Wax Tape Coating are included in Section 09 93 00.

1.03 SUBMITTALS

Submit to the Engineer, as provided in Section 01 32 19, supplier information, and complete detailed Shop Drawings showing materials, properties and details of fabrication, construction and installation.

1.04 REFERENCE STANDARDS

A. American Water Works Association (AWWA)

   1. AWWA C207 - Steel Pipe Flanges for Waterworks Service-Sizes 4 Inch Through 144 Inch (100mm Through 3,600mm)

   2. AWWA C213 – Fusion Bonded Epoxy Coatings And Linings for Steel Water Pipe and fittings

   3. AWWA C219 – Bolted, Sleeve-Type Couplings for Plain-end Pipe

   4. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 Mm Through 1,500 Mm), for Water Transmission and Distribution
B. American National Standards Institute (ANSI)

1. ANSI/AWWA C111/A21.11 – Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

2. ANSI/AWWA C153/A21.53 - Ductile-Iron Compact Fittings for Water Service

C. American National Standards Institute (ANSI)

1. ANSI/ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250

2. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24

3. B18.2.1 – Square. Hex, Heavy Hex, and Askew Head Bolts and Hex, heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)

D. American Society for Testing and Materials (ASTM)

1. A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High-Temperature or High Pressure Service and Other Special Purpose Applications

2. A194 - Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. All materials and appurtenances shall be at least rated for pressure class of the piping system they connect to, but in no case shall they be rated less than 150 psi.

2. Furnish and install all necessary pipe appurtenances, including flanges, bolts, nuts, gaskets, washers, guides, supports, straps, anchors, hangers, couplings, insulation, hardware, and all other appurtenant items shown on the Drawings, specified or required for proper and complete installation and operation of the piping system.

3. All materials to come in contact with potable water shall be NSF 61 certified.
B. Flanges:

1. Slip-on and welding neck flanges required for joining pipe to valves, fittings and equipment shall be 150 pound forged steel flanges conforming to ASME B16.5 or they may be steel plate flanges conforming to the requirements of AWWA C207 Class D, design pressure 175 psi, except that hubs may be omitted.

2. Contractor shall be responsible for proper mating of all flanged connections.

3. Flanges shall be flat-faced with serrated finish (32 serrations per inch, 1/64-inch deep, spiral or concentric) and shall be back-faced or spot-faced at bolt holes.

4. Flange bolts for standard service shall be ASTM A193 Grade B7 with ASTM A194 Grade 1 nuts. Flange bolts for buried or submerged service shall be ASTM A193 Grade B8N with ASTM A194 Grade 8 nuts. Bolts and nuts shall have hexagonal dimensions in accordance with ASME B18.2.1.

5. Flange gaskets for pipe of 14-inch diameter and smaller shall be 1/16-inch thick rubber with cloth insertions and for pipe greater than 14-inch diameter shall be 1/8-inch thick rubber with cloth insertions. Gaskets shall be John Crane Co. Style 777, Manville No. 109 or an approved equivalent.

6. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange.

7. Slip-on flanges conforming to ASME B16.5 may be faced prior to welding to the pipe or fitting to which they are attached, provided that care is exercised in the welding process to prevent warping of the flanges. Final machining of the contact faces of slip-on flanges conforming to AWWA C207 shall be performed after the flange has been welded to the pipe.

C. Bolted Flexible Couplings - Groove Type: Groove type flexible couplings shall conform to the following requirements:

1. Groove type flexible couplings shall consist of malleable iron housing clamps in segments, rubber gaskets and oval neck track head bolts.

2. Grooved couplings shall be designed for a water working pressure not less than the design pressure of the pipe on which they are to be installed. In no case, it shall be rated for less than 150 psi.

3. The housing shall have keys formed to fit grooves in the pipe to be joined, designed to resist longitudinal forces and to permit angular deflection.
4. Couplings for steel pipes, 2 inches through 12 inches, shall be Victaulic Style 77. The gasket shall be Grade E, suitable for water service, and made from EPDM. Approved equivalent products from other manufacturers will be acceptable.

5. Couplings for steel pipes, 14 inches through 42 inches, shall be Victaulic Style W77 with Advanced Groove System Vic-Ring. The gasket shall be Grade E, suitable for water service, and made from EPDM. Approved equivalent products from other manufacturers will be acceptable.

6. Couplings shall be provided with similar nuts and bolts as used for flanges described herein for corresponding services. Bolts shall additionally receive Teflon tape thread wrap or anti-seize compound prior to assembly.

7. Coupling manufacturer shall supply the Class B ring adapters for the closure piece to insure the coupling and ring adapter match.

D. Bolted Flexible Couplings - Sleeve Type: Sleeve type flexible couplings shall conform to the following requirements:

1. Sleeve type flexible couplings shall have diameters that properly fit the outside of the pipes being connected.

2. Each coupling shall consist of the following:
   a. Ductile iron steel middle ring with handle meeting the requirements of ASTM A536.
   b. Two end rings with gaskets.
   c. NBR gasket meeting the requirements of ASTM D2000.
   d. Stainless steel 304 armors bonded to gasket.
   e. Stainless steel 304 bolts and nuts.

3. Interior and exterior surfaces of all ferrous material shall be coated with powdered resin fusion bonded epoxy in accordance with AWWA C213 and meeting requirements of NSF 61.

4. Couplings shall be designed for a water working pressure not less than the design pressure of the pipe on which they are to be installed.

5. Couplings shall be two-bolt coupling, Macro HP as manufactured by Romac or an approved equivalent.
E. Grooved Cap: Grooved cap shall be of cast iron if tapping is not required. If grooved cap is required to be tapped for installation of valves or other appurtenances, it shall be of steel materials.

F. Threaded Insulating Connections:

1. Threaded insulating bushings, unions, and couplings shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are indicated.

2. Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other non-conductive materials and shall have ratings and properties suitable for the service and loading conditions indicated.

G. Pipe Threads:

1. Pipe threads shall comply with ANSI/ASME B1.20.

H. Insulating Flange Joints:

1. Insulating flange joints shall be made up utilizing a standard insulating joint set and shall be for the proper pressure rating of flanges.

2. Set for each joint shall include a full face, neoprene coated, Type E insulating gasket, bolt sleeves, insulating washers, and steel washers, as required.

   a. Gasket: The gasket shall be full faced, Type "E" phenolic material with nitrile O-ring seal for operation between 20°F and 150°F. Gaskets shall be suitable for the temperature and pressure rating of the piping system in which they are installed. The Contractor shall insure that the O-ring diameter of the gasket matches the sealing surfaces of both flanges.

   b. Sleeves: The insulating sleeves shall be 1/32-inch thick tube, full length, laminated G-10 glass material per NEMA LI-1 for operation between 20°F and 150°F. For installation at threaded valve flanges, the sleeves shall be half-length.

   c. Insulating Washers: The insulating washers shall be 1/8-inch thick laminated G-10 glass material per NEMA LI-1 for operation at ambient temperatures to be placed directly adjacent to the flange face.

3. Each joint shall be carefully assembled in accordance with the manufacturer's instructions. Care shall be taken to ensure that the bolt sleeve is of proper length to compensate for smooth faced flanges so that
the bolt sleeve will recess into the insulating washers without projecting beyond them.

4. Insulating joint sets shall be as manufactured by Calpico, Inc., South San Francisco, CA; Corrosion Control Products Company, Gardena, CA; or approved equivalent.

I. Pipe Expansion Joints:

1. Rubber Type Joint. Rubber type expansion joint shall be double wide arch flange spool, Style 232 as manufactured by PROCO or approved equivalent. Rubber type joint shall be installed on aboveground 14-inch pump suction pipe as shown on the Drawings.

   a. Expansion joint shall be rated for at least 100 psi water pressure and 26 psi vacuum at 70 degrees Fahrenheit water temperature and 100 degrees Fahrenheit ambient temperature.

   b. Natural length of the joint assembly shall be 14 inches.

   c. Joint shall have required number of limit/control rods placed across the expansion joint. These limit/control rods shall not allow more than 1.5 inches axial extension of the joint and shall not allow more than 2.0 inches axial compression of the joint. Rods installations shall be field adjusted as required to achieve the specified maximum axial extension and compression of the joint.

J. Fire Hydrants:

1. Fire hydrants shall be 6-inch wet barrel type, 200 psi rated, and with three outlets, 2 ½” x 2 1/2” x 4”.

2. The fire hydrant shall have a break-off check valve.

3. Fire hydrant shall have break-away spool. The break-away spool shall be ductile iron or cast-iron spool with integrally cast flanges and machined or cast exterior grooves.

   The break-away spool shall be connected to the fire hydrant with 3/4” hex head machine break-away bolts. Bolts and nuts shall be Grade 316 Stainless Steel.

4. Fire hydrants shall be supplied by AVK Series 2452 with additional features listed above.
5. Fire hydrants shall be painted Sunburst yellow (by Rust-Oleum) in accordance with AWWA C503. Two coats of primer shall be placed prior to applying the final coat.

6. Hydrant bury shall be 6 inches inside diameter made of ASTM A536 ductile iron. The bury shall be one piece with the top having a flange drilled with 6 holes to receive the extension spool or fire hydrant. The bottom shall have a 90° bend with a mechanical joint fitting.

K. PVC Bolted Flexible Coupling Assemblies - Sleeve Type: Sleeve type flexible couplings to be used for PVC pipe shall conform to the following requirements:

1. Sleeve type flexible couplings shall have diameters that properly fit the outside of the pipes being connected. Each coupling shall consist of a steel middle ring with a thickness of at least 1/4-inch, two steel followers, two rubber-compounded wedge section gaskets and a sufficient number of trackhead bolts to compress the gaskets properly. A pipe stop on the middle ring that limits any movement of the coupling will not be permitted.

2. Interior surfaces of the middle ring shall be coated with powdered resin fusion applied epoxy in accordance with AWWA C213.

3. Couplings shall be Smith-Blair Series 411 or an approved equivalent.

L. Tapping Sleeves and Valves

1. Tapping sleeves shall be stainless steel body of the full circumference type and stainless steel flanged outlet.

2. Each tapping sleeve shall be specifically manufactured for the type of pipe it is to be installed on by the tapping sleeve manufacturer and have a pressure rating no less than that of the connected pipelines. In no case, the pressure rating shall be less than 200 psi.

3. Tapping sleeves shall be Model SST III by Romac, JCM 432 as manufactured by JCM Industries, or and approved equivalent.

4. Tapping valve shall be a resilient-wedge gate valve in accordance with the requirements under Section 11 26 70.

5. The entire exterior surface of the tapping sleeve and valve shall be encased with an 8-mil thick minimum polyethylene plastic film wrap and secured with a 10-mil thick minimum corrosion protection tape.

M. PVC Pipe Joint Restraints
1. Joint restraints for PVC pipe shall be ductile iron and consist of a full circumference bell restraint and restraint ring bolted together to form a complete restraint system. Restraint ring shall provide restraint along the spigot side of the pipe by means of teeth or serrated grips on and all around the inside of the restraint ring which are compressed against the PVC pipe to form a circumferentially even pressure all around the pipe providing a means to restrain the spigot end. Bell end restraint ring shall rest against the back of the shoulder of the PVC bell to provide a wedge action to restrain the bell end.

2. AWWA C-900 joint restraints shall be Megalug Series 1600 for straight PVC pipe and Megalug Series 19xx00 for ductile iron fittings or approved equivalent.

N. PVC Pipe Flanged Adapter

1. Flanged adapters for joining PVC pipe to a mating steel or cast iron mating flange shall be similar to and tested in accordance with AWWA C219 and be manufactured specifically for the connection of plain end PVC pipe to a mating steel or ductile iron flange for connection to PVC pipe.

2. Flanged adapters shall be constructed of stainless steel or ASTM A538 ductile iron.

O. Valve Stacks and Covers

1. Valve covers shall be traffic rated, long body, designated “WATER”, color coded and painted as follows:

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>2” Service Line Valve</td>
<td>Blue</td>
</tr>
<tr>
<td>Fire Hydrant Valve</td>
<td>Yellow</td>
</tr>
<tr>
<td>In-Line Valve</td>
<td>White</td>
</tr>
<tr>
<td>Zone Valve</td>
<td>Red</td>
</tr>
</tbody>
</table>

2. Valve stacks shall be a two-piece telescoping type consisting of an 8 inch PVC C900, SDR 35 or Schedule 40 lower section. The top section shall be an 8 inch 10-gage galvanized split steel pipe.

PART 3 - EXECUTION

3.01 INSTALLATION AND INSPECTION
A. The Contractor shall permit and aid in the inspection of the internal and external coatings of appurtenances at the time of installation and shall repair any damage before assembling such appurtenance.

B. The method of assembly and operation of appurtenances shall be in strict accordance with the manufacturer's instructions, Contract Documents, and City's applicable Standards.

C. The Contractor shall excavate holes in the trench as required for installation of pipe appurtenances.

D. All appurtenances shall be handled in a manner to prevent any injury or damage to any part of the valve. All joints shall be thoroughly cleaned and prepared prior to installation.

E. Before flanged joints are assembled, the flange faces shall be thoroughly cleaned of all foreign material with a power wire brush. The gasket shall be centered and the connecting flanges drawn up watertight without unnecessarily stressing the flanges. All bolts shall be tightened in a progressive diametrically opposite sequence and torqued with a suitable, approved and calibrated torque wrench. All clamping torque shall be applied to the nuts only.

F. All buried appurtenances, including flanges and couplings that are not required to be concrete encased, shall protected in accordance with Section 09 91 00 and Section 09 93 00.

END OF SECTION
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PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, material, equipment and incidentals required to test, flush and disinfect water pipelines and appurtenances as shown on the Drawings and as specified herein.

B. The work shall include the following:

1. Cleaning and disinfecting all new pipelines, valves, appurtenances, and their connections to existing pipelines.

2. Performing dye penetration test of all field-welded joints for steel pipe unless they are to be tested using hydrostatic test as specified herein and as approved by the Engineer. Dye penetration tests of welded joints shall be performed for welded steel pipelines between new 14-inch butterfly valve along suction pipe at La Granada Reservoir connection and new 16-inch butterfly valve on pump discharge pipe outside the building. All joints with existing steel pipe shall be tested using dye penetration method.

3. Performing hydrostatic testing of all steel pressure pipelines unless they are to be tested using dye penetration test as specified herein and as approved by the Engineer. All steel pipelines between new 16-inch butterfly valve on pump discharge pipe outside the building and connection to existing pipe in North Conejo School Road shall be hydrostatically tested.

4. Hydrostatic testing of all PVC pressure pipelines, including blow-off and AVARV piping.

5. Hydrostatic testing of blow-off and AVARV piping for 14-inch reservoir inlet-out.

6. Handling dechlorinated water and water used for cleaning, flushing, and testing.

1.02 RELATED WORK

A. Temporary Environmental Controls are included in Section 01 56 00.
B. Steel Pipe and Fittings are included in Section 02 62 00.
C. Small Diameter PVC Pipe and Fittings are included in Section 02 63 00.
D. Pipe Appurtenances are included in Section 02 64 40.

1.03 SPECIFICATIONS AND STANDARDS
A. Except as otherwise indicated, the current editions of the following apply to the work of this Section:
   1. ANSI/AWWA B300 – Hypochlorites
   2. ANSI/AWWA B301 – Liquid Chlorine
   3. AWWA C651 – Disinfecting Water Mains
   6. APHA, AWWA and WEF – Standard Methods for the Examination of Water and Wastewater

1.04 SUBMITTALS
A. The following shall be submitted:
   1. Method, material, and procedure for dye penetration tests to be performed for welded joints.
   2. Qualifications for person performing dye penetration tests, including a copy of certificate for Level II NDT.
   3. Procedure, material, and equipment to be used for cleaning and flushing of pipelines. Provide a layout plan showing locations of water connections, equipment, materials, and temporary components to be used for water conveyance, cleaning and flushing.
   4. Procedure, material, and equipment to be used for performing hydrostatic test for pipelines. Provide a layout plan showing locations of water connections, equipment, materials, and temporary components to be used for water conveyance, and hydrostatic test.
5. Calculations for allowable water leakage during hydrostatic test for each pipeline reach being tested based on the specified allowable leakage criteria and approved pipeline shop drawings.

6. Materials and procedure to be used for disinfecting pipes and pipe connections. Provide a layout plan showing locations of water connections, chlorine injection locations, equipment, and temporary components to be used.

7. Procedure, material, and equipment to be used for handling water used for cleaning, flushing, testing, and disinfection of pipelines. Provide a layout plan showing locations of water discharge locations, equipment, and temporary components to be used.

8. Locations of temporary blind flanges and/or bulkheads and air-release valves if required.

9. Design and locations of temporary thrust restraints as required.

10. Qualifications of firms performing tests.

11. Test results and reports with details.

**PART 2 - PRODUCTS**

**2.01 MATERIALS REQUIREMENTS**

A. All test equipment, chemicals for chlorination, temporary valves, temporary blow-offs, temporary bulkheads and blind flanges, temporary manual air release valves, temporary thrust restraining system, temporary pressure gauges, and other required equipment and materials shall be determined and furnished by the Contractor.

B. No materials shall be used which would be injurious to the pipeline or its future function.

C. Potable water shall be used for testing and chlorination and the Contractor shall be held solely responsible for ensuring that a sufficient water source is available for all pipeline disinfection operations.

D. Chlorine for disinfection shall be in the form of liquid chlorine, sodium hypochlorite solution, or calcium hypochlorite granules. Sodium hypochlorite tablets and adhesive disinfection procedures are not acceptable and shall not be used.
1. Liquid chlorine solution shall be in accordance with the requirements of ANSI/AWWA B301.

2. Sodium Hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300.

3. Calcium hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300.

E. Required equipment, materials, and chemicals for performing dye penetration tests.

F. Required equipment, materials, and water for cleaning, and flushing pipelines.

G. Required equipment, materials, and water for hydro testing pipelines. This includes, but is not limited to

1. Temporary air release blow-offs/drain, and isolation valves.

2. Temporary bulkheads, blind flanges and/or test plates.

3. Temporary pressure gauges, meters, pumps, and backflow preventers.

4. Temporary piping system for conveying water.

5. Test water. Test water will be available from the City’s piping system. The Contractor shall coordinate with the City for determining location of the source of water.

H. Required equipment and materials for dechlorinating water.

**PART 3 - EXECUTION**

**3.01 GENERAL**

A. All cleaning, testing and disinfection operations shall be performed in the presence of the City.

B. Testing of field welds and buttstraps shall be completed prior to pipeline cleaning and disinfection.

C. The Contractor shall install required temporary facilities, including valves, blow-offs, bulkheads, blind flanges, manual air release valves, thrust restraining system, pressure gauges, etc.
D. The Contractor shall make all necessary arrangements for conveying water to the points of use.

E. Pipeline shall be cleaned and flushed of deleterious materials such as construction debris, dirt, rocks, etc. prior to testing and disinfection.

F. A reduced pressure principle backflow preventer shall be installed at each connection with water pipelines in accordance with the requirements of the City.

G. After satisfactory cleaning, testing and disinfection of pipelines and appurtenances, all temporary facilities shall be removed.

3.02 DYE PENETRATION TEST OF WELDED JOINTS

A. All field welded joints of steel piping shall be tested for integrity by use of the dye penetration method unless they are to be tested using hydrostatic test as specified in this Section and as approved by the Engineer. Joints to tested using hydrostatic pressure test need not be tested using dye penetration test.

1. Unless otherwise approved, welded joints on new pipelines from connection to the existing reservoir 14-inch inlet-outlet pipe to 16-inch butterfly valve on pump discharge side outside the building shall be tested using dye penetration method.

2. All joints with existing pipe shall be tested using dye penetration method.

B. Contractor shall furnish all required materials, equipment and labor to perform dye penetration tests. All tests shall be performed in the presence of the City. All dye penetration tests shall be performed by a certified Level II NDT. The Contractor shall notify the City at least 48 hours in advance of each scheduled test.

C. The surface of the welds to be tested shall be cleaned immediately prior to application of the penetrant and developer, free of oil, grease, rust, oxide deposits and other material which might interfere with performance of the test or interpreting the results thereof.

D. The penetrant shall be applied to the weld surface by brushing or spraying in a manner that properly covers the area at the application rate recommended by the manufacturer of the penetrant.

E. The penetrant shall be allowed to remain on the weld as recommended by the manufacturer after which the penetrant shall be wiped from the weld with a clean cloth saturated with solvent.
F. The developer shall then be applied to the weld surface under test in a manner that will provide a thin uniform thickness of coating, precluding laps and runs and insure clear cut indication of possible passage of penetrant into the weld. Application of the developer shall be in accordance with the manufacturer's recommendations.

G. As the developer dries to a smooth, even white coating, the appearance of red spots or streaks showing up on the developer film shall be considered points at which leakage of water through the joint can occur.

H. Materials used in the dye-check test shall be the project of Turco Products, Inc., 24600 South Main Street, Wilmington, California, or an approved equivalent.

I. All potential points of leakage from the welded steel pipe joint as evidenced by the dye-check method herein before described shall be corrected by rewelding and retesting until such potential points of leakage are eliminated. Upon completion of the tests and repairs, as may be required, the penetrant and developer shall be removed from the metal surfaces and the filling of interior joint recesses may proceed.

3.03 HYDROSTATIC TESTING OF PIPELINES

A. All steel piping shall be tested using hydrostatic pressure method unless they are to be tested using dye penetration tests as approved by the Engineer. Unless otherwise approved, new pipelines from 16-inch butterfly valve on pump discharge piping to the connection to existing pipe in North Conejo School Road shall be tested using hydrostatic pressure method.

B. All new 10-inch PVC piping system along La Granada Drive, associated branches and blow-off and AVARV piping shall be tested using hydrostatic pressure method.

C. Hydrostatic testing shall be performed for blow-off and AVARV piping for 14-inch reservoir inlet-out modification in Mountain Crest Circle.

D. All hydrostatic testing shall be performed using gauges and meters that have been calibrated and certified annually. Pressure and leakage testing shall be performed in accordance with the applicable requirements of ANSI/AWWA C600 and as specified herein. The City shall be provided with certified testing results.

E. All labor, materials, tools, and equipment for testing shall be furnished by the Contractor. Ends of each test section, open ends of pipes, and fittings shall be suitably closed.
F. Prior to hydrostatic testing, all pipelines shall be flushed or blown out using a flushing ball or pig as appropriate. The Contractor shall test all pipelines either in sections or as a unit.

G. No section of the steel pipeline shall be tested until all field-placed concrete or mortar has attained an age of 14 Calendar Days, excepting if the field placed mortar is quick setting mortar. When using quick setting cement mortar, the pipeline may be tested within 24 hours of placement.

H. All concrete thrust blocks shall be cured in place for at least 14 Calendar Days before starting hydrostatic test, excepting if the field placed concrete is high early strength type. When using high early strength concrete, the pipeline may be tested within 4 days provided concrete has obtained at least 75% of its 28-day strength.

I. Test bulkheads and other appurtenances shall be located and installed in a manner to provide air gap separation between existing water pipelines and the pipeline being tested.

J. The Contractor shall be responsible for ascertaining that all test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to, or movement of, the adjacent pipe. Any unrestrained joints, unharnessed sleeve-type couplings, expansion joints, or other sliding joints shall be restrained or suitably anchored prior to the test, to avoid movement and damage to piping and equipment.

K. The Contractor shall provide sufficient temporary air tappings in the pipelines to allow for evacuation of all entrapped air in each pipe segment to be tested. After completion of the tests, such taps shall be permanently plugged. Care shall be taken to see that all air vents are open during filling.

L. The pipeline shall be filled at a rate that will not cause any surges or exceed the rate at which the air can be released through the air valves at a reasonable velocity and all the air within the pipeline shall be properly purged. The pipeline shall be filled at a rate such that the average velocity of flow is no greater than 1 fps. At no time shall the maximum velocity of flow exceed 2 fps.

M. All air should be purged from the pipeline before checking for leaks or performing pressure tests on the system. To accomplish this, if air valves, hydrants, or other outlets are not available at high points, taps shall be made to expel the air, and these taps shall be tightly plugged after testing.

N. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least 72 hours to allow the mortar lining of steel piping, to absorb water, to allow material expansions, and to allow the escape of air from any air pockets. During this period, bulkheads, valves, and
connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to the City shall be taken. If a large quantity of water is required to increase the pressure during testing, entrapped air, leakage at joints, or a broken pipe may be suspected and tests should be discontinued until the source of trouble is identified and corrected.

O. For the hydrostatic and leakage test, the pipeline shall then be brought up to the test pressure specified and this pressure shall be maintained on the section under test for a period of not less than four hours.

P. Test Pressure: The test pressure for steel pipe shall be 120 psi at the La Granada Reservoir site (equals to approximately 1,335 feet HGL elevation). The test pressure for PVC pipe system along La Granada Drive shall be 150 psi near Intersection of Erbes Road and La Granada Drive (equals to approximately 1,290 feet HGL elevation). The test pressure for AVARV and blow-off piping for 14-inch reservoir inlet-outlet shall be 100 psi (equals to approximately 1,227 feet HGL elevation).

Q. All visible leaks shall be repaired in a manner acceptable to the City.

R. If additional water is required to maintain the test pressure during the test period, then leakage of the system is occurring. The faulty work shall be located and corrected and the test repeated. The work shall be restored and all damage resulting from leaks repaired. All unacceptable leakage shall be eliminated.

S. Allowable Leakage:

1. The maximum allowable leakage for distribution and transmission pipelines shall be 10 U.S. gallons per inch of diameter per mile of pipe per 24 hours for pipe with 40 feet or greater lengths between joints and with rubber-gasketed joints and 20 U.S. gallons per inch of diameter per mile of pipe per 24 hours for pipe with 20 feet or less lengths between joints and with rubber-gasketed joints.

2. Pipe reaches with welded or fused joints and flanged connections shall have no leakage.

3. For pipeline reaches with both gasketed and welded joints, allowable leakage shall be determined based on the criteria noted in this paragraph and lengths of pipe with each type of joint as approved by the Engineer.

4. Contractor shall submit calculations for allowable water leakage during hydrostatic test for each pipeline reach being tested based on the specified criteria and approved pipeline shop drawings for Engineer’s approval.
T. In the case of pipelines that fail to pass the prescribed leakage test, the Contractor, at his own expense, shall determine the cause of the leakage, shall take corrective measures necessary to repair the leaks, and shall again test the pipelines, including but not limited to, excavating as necessary to locate and repair leaks or other defects which may develop under test, replacing such excavated material, and making all repairs necessary to secure the required watertightness.

U. The pressure test shall be repeated until the pipe meets test requirements. The duration of the final test shall be not less than four hours. The cost of all water used in both testing and retesting shall be paid by the Contractor.

V. After satisfactory test, water shall be handled in accordance with this Section.

3.04 DISINFECTING PIPELINES AND CONNECTIONS

A. General:

1. Chlorination shall be in accordance with the instructions of the chlorinator manufacturer. All water pipelines shall be disinfected in accordance with the requirements of ANSI/AWWA C651 using the Continuous-Feed Method as modified herein prior to being placed into service.

2. The Contractor shall install required temporary facilities, including valves, blow-offs, bulkheads, blind flanges, manual air release valves, thrust restraining system, etc.

B. Chlorination: A chlorine-water mixture shall be uniformly introduced into the pipeline by means of a solution-feed chlorinating device. Cement-mortar lined pipe shall not be filled with water until a minimum period of eight hours has elapsed after the last joint in any section has been made. An approved and tested reduced pressure principle backflow prevention assembly shall be installed on the water supply to prevent the strong chlorine solution in the line being disinfected from flowing back into the line supplying the water. The assembly shall be on the approved list of the County of Ventura Environmental Health Department and shall be tested prior to use by a tester approved by the County of Ventura Environmental Health Department. The assembly shall be as approved by the City.

1. Point of Application: Chlorine solution shall be applied at the beginning of the section to be chlorinated and shall be injected through a corporation stop, a hydrant, or other approved connection to ensure treatment of the entire system being disinfected. All required corporation stops and other plumbing materials necessary for chlorination or flushing of the main shall be installed by the Contractor.
2. Injection Rates: Potable water shall be introduced into the pipeline at a constant measured rate. Chlorine solution shall be injected into the potable feed water at a measured rate. The two rates shall be proportioned so that the chlorine concentration in the pipeline is maintained at a minimum concentration of 50 mg/l, with a minimum chlorine residual of 25 mg/l after 24 hours in the pipe. The concentration at points downstream shall be checked periodically during the filling to ascertain that sufficient chlorine is being added.

C. Chlorine Residual Test: The City will make 24-hour chlorine residual tests. The City will notify the Contractor of the chlorine test result. Chlorinated water shall be retained in the pipeline for at least 24 hours. After the chlorine-treated water has been retained for the required time, the free chlorine residual at the pipeline extremities and at other representative points shall be at least 25 mg/l.

1. After the chlorine solution applied by the continuous feed method has been retained in the pipeline for 24 hours, samples shall be taken at air valves and other points of access to confirm that a chlorine residual of 25 mg/l minimum exists along the pipeline.

D. Repetition of Test: The disinfection testing procedure shall be repeated if the initial tests fail to produce satisfactory results. Two consecutive satisfactory test results shall be required after any unsatisfactory test. The Contractor shall be responsible for all costs of re-disinfection and retesting due to test failure, without additional cost to the City.

E. Chlorinating Valves: During the process of chlorinating the pipelines, all valves and other appurtenances shall be operated while the pipeline is filled with the heavily chlorinated water.

F. Final Flushing: Final Flushing shall be done by the Contractor after he has been notified of a satisfactory chlorine residual test by the City. After the applicable retention period, the heavily chlorinated water shall be flushed from the pipeline until chlorine measurements show that the concentration in the water leaving the pipeline has a chlorine value around 2.0 mg/l of the replacement water generally prevailing in the system or is acceptable for the intended use.

G. Disinfection of Connections: Pipe and appurtenances used to connect existing and new water pipelines and short reach (10’ or less) of new pipe used for replacement of existing pipe shall be spray-disinfected using a 3% percent solution of chlorine just prior to being installed in accordance with ANSI/AWWA C651.

H. Neutralization of Chlorinated Water: Neutralizing and disposing of chlorinated water shall be in accordance with Appendix "C" of ANSI/AWWA Standard
C651 and General Permit for Discharges of Low Threat Hydrostatic Test Water to Surface Water requirements.

I. After satisfactory disinfection, air valves shall be replaced, the pipe coating restored, and temporary disinfection and test facilities removed.

3.05 HANDLING WATER

A. Water used for Preliminary Cleaning and Flushing:

1. Water used for preliminary cleaning and flushing at La Granada Pump Station and Reservoir site may be used for dust control and/or irrigation within the La Granada Pump Station and Reservoir site provided it does not contain debris and at locations approved by the City. All debris, if any, shall be disposed of off the Site. Water shall be spread evenly on the approved area, avoiding flooding in any given area. Water that cannot be used for irrigation purpose at the La Granada Pump Station and Reservoir site shall be disposed of per 3.05.C.

2. Water used for preliminary cleaning and flushing for 10-inch pipeline system along La Granada Drive shall be disposed of per 3.05.C.

B. Chlorinated Water:

1. Water used for disinfection shall be neutralized using a reducing agent prior to discharging. Neutralizing of chlorinated water shall be in accordance with Appendix "C" of AWWA Standard C6. Water to be discharged shall have chlorine residual less than 0.1 mg/l.

2. Dechlorinated water at La Granada Pump station and Reservoir site shall be handled per 3.05.A.1.

3. Dechlorinated water from 10-inch pipeline system along La Granada Drive shall be handled per 3.05.C.

C. Debris free and dechlorinated water that cannot be used for irrigation or dust control shall be disposed of into the City’s sewer system or off the site in a legal manner using trucks or other means as acceptable to the City. Notify City at least 7 days in advance of water release into City’s sewer system.

D. Install required temporary material and equipment to convey water to the discharge location. Remove all temporary material and equipment after they are no longer required.

3.06 BACTERIOLOGICAL TESTING (BAC-T)

A. The City will perform bacteriological testing of disinfected pipelines.
B. If disinfection fails to produce satisfactory bacteriological counts (that is, no coliform bacteria shall be present), the pipe shall be re-flushed and will be resampled and retested. If counts from analysis of the second samples fail to produce satisfactory bacteriological counts, the pipe shall be re-disinfected and will be resampled and retested until satisfactory results are obtained. The Contractor shall be responsible for all repeat bacteriological testing costs.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install irrigation system as shown on the Drawings, as specified herein, and as required to provide complete and functional system.

B. Furnish all labor, materials, equipment and incidentals required to remove and modify the existing irrigation system as shown on the Drawings, as specified herein, and as required.

C. The work of this Section includes, but is not limited to, installation of pipes, fittings, bubblers, sprinklers, quick couplers, valves, automatic control valves, irrigation controller, valve boxes, riser assemblies, electrical and communication conduits, wires, cables, electrical connections, electrical pull boxes, and appurtenances.

D. Perform field testing, adjustments, startup, and cleanup.

1.02 RELATED WORK

A. Operation and Maintenance Data (Technical Manuals) are included in Section 01 32 19.

B. Basic electrical materials and methods are included in Division 16.

1.03 STANDARD SPECIFICATIONS

Except as otherwise modified and supplemented in this Section, the Contractor shall comply with the requirements of Standard Specifications for Public Works Construction (SSPWC) for furnishing and installing irrigation system.

1.04 SUBMITTALS

A. The following shall be submitted in compliance with Section 01 32 19:

1. Affected Existing System Inventory: Take detailed field inventory of the existing system and components that will be affected by demolition and new construction. Take detailed field notes and digital photos and videos of
existing system and components that will be affected by demolition and new construction and submit to the Engineer prior to make any changes to existing system.

2. Irrigation Piping System, Valves, and Appurtenances:

   a. Technical information and manufacturer's catalog data for pipes, fittings, bubblers, sprinklers, isolation and check valves, automatic control valves, valve boxes, riser assemblies, pull boxes, quick couplers, and any other appurtenances to be installed.

3. Irrigation Controller and Associated Items:

   a. Technical information and manufacturer's catalog data for irrigation controller and enclosure and wiring diagram.
   
   b. Operation and maintenance manual.
   
   c. Conduit and Wires.
   
   d. Pull Boxes.

4. Field test results and startup report(s).

1.05 MANUFACTURER’S SERVICES

A. Installation Services. The services of a qualified factory representative shall be provided as required to check the installation, make field adjustments and place assemblies/components/instruments/equipment in service.

B. Perform testing and startup for irrigation system, including piping, valves, and associated components. A report summarizing results of startup process shall be submitted to the Owner.

1.06 EXISTING FACILITIES AND CONDITIONS

A. The Contractor shall be responsible for coordinating the work with the operation of existing utilities and new utilities on the project.

B. The Contract Documents are generally diagrammatic and indicative of the work to be installed. The Contractor shall investigate the finished conditions affecting all work and plan work accordingly.

C. Take detail inventory of existing irrigation system per Paragraph 3.01.
PART 2 - PRODUCTS

2.01 PIPING AND FITTINGS

A. All pressure pipe and fittings to be installed underground shall be Schedule 40 PVC. All threaded fittings shall be injection molded. All tees and elbows shall be side grated.

B. All pressure pipe and fittings installed above ground shall be UV resistant Schedule 40 PVC.

C. Pipe sleeves shall be schedule 40 PVC pipe. Sleeves shall be two times the pipe size diameter.

D. All threaded nipples shall be standard weight schedule 80 PVC with molded threads. All threaded nipples shall be gray in color.

E. PVC pipes shall be as manufactured by Pacific Plastics or approved equivalent.

F. PVC fittings shall be as manufactured by Lasco Co. or approved equivalent.

2.02 REMOTE CONTROL VALVES

A. The remote control valve shall be similar to the existing.

B. Valve shall be housed in a plastic valve box.

2.03 SHUT OFF VALVES

All shut off valves 3 inches and smaller shall be in accordance with Section 02 64 20.

2.04 BUBBLERS

Bubblers shall be similar to the existing.

2.05 VALVE BOXES

A. Unless otherwise shown, all valve boxes shall be green in color.

B. Rectangle valve boxes shall be used for control valves, master control valves, pressure regulators, flow sensors, wye strainers, filtration devices, ball valves, butterfly valves and pull boxes.

C. Round valve boxes shall be used for quick coupler valves.
D. Rectangular valve boxes shall be 9-1/2 inches wide by 16 inches long and 11 inches high. Round valve boxes shall be 10 inches in diameter and 10 1/4 inches high. All valve boxes shall be constructed of rigid polyolefin.

E. Heat brand all box lids with the appropriate two-inch high identification letters and/or numbers.

F. Valve boxes shall have locking covers secured with 3/8-inch stainless steel bolts and washers.

G. Valve boxes shall be as manufactured by Carson, Brooks, or approved equal.

H. All valve boxes shall have 6 inch-thick minimum pea gravel bed.

2.06 AUTOMATIC CONTROLLER UNIT

A. The automatic controller shall be an electrically timed device for automatically opening and closing remote control valves.

B. The irrigation controller shall be Rain Master Eagle Plus capable up to 48 stations. No substitute.

2.07 CONDUCTORS

Control Wires: All control wires shall be solid copper, 600-volt, type UF, conforming to SSPWC, Subsection 212-3.2.

2.08 KEYS

A. Two sets of keys shall be provided for the following items. All keys shall be identified by equipment number by means of stainless steel or solid plastic tags.

1. Irrigation controller enclosure

PART 3 - EXECUTION

3.01 GENERAL

A. Take detailed inventory of existing irrigation system and components that will be affected by new construction. This shall include field notes and digital photographs and videos of the existing components that will be affected by new construction. Submit details of the existing components to the Engineer prior to demolition of or modification to existing components.
B. Remove and modify existing irrigation system as shown on the Drawings and as required for construction purpose as approved by the Engineer.

C. Installation of the irrigation system shall be performed after the finish grading, but prior to paving.

D. The total number of sprinkler heads/bubblers and circuits and size of pipes shall be not less than indicated unless otherwise approved.

E. Install all equipment, devices and appurtenances in accordance with the manufacturer’s recommendations, as shown on the Drawings, and as specified herein.

3.02 PIPING

A. Unless otherwise shown on the Drawings or approved in writing by the Engineer, the minimum earth cover over piping shall be as listed below.

<table>
<thead>
<tr>
<th>Pipe</th>
<th>Minimum Earth Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure mains 3 inches and larger</td>
<td>18 inches</td>
</tr>
<tr>
<td>Pressure mains 2 ½ inches and smaller</td>
<td>12 inches</td>
</tr>
<tr>
<td>Lateral lines</td>
<td>6 inches</td>
</tr>
</tbody>
</table>

B. All lines shall have a minimum clearance of 4 inches from each other and 24 inches from any other lines from other trades.

C. Backfill material shall be On-Site Select Fill Material in accordance with Section 02 20 00 and compacted to 95% relative density.

D. No flooding shall be performed to compact trenches.

E. All threaded pipe and fittings shall be assembled using Teflon tape or equivalent applied to the male threads only.

F. All plastic slip fittings shall be solvent welded in accordance with pipe manufacturer's recommendations.

3.03 VALVE BOXES

Valve boxes shall be set in clean pea gravel laid over filter fabric. The Contractor shall burn and then paint the identification number of the valve and the controller clock on the cover of the valve box. The paint shall be aluminum asphaltic-based waterproof paint.
3.04 IRRIGATION CONTROLLER

A. Irrigation controller shall be installed per manufacturer’s written instructions.

B. The controller shall be wall mounted in a watertight enclosure using stainless steel hardware. Exact location shall be determined in field as directed by the owner.

C. All new conduits and wires shall be installed to and from the controller as required and as shown on the Drawings.

3.05 ELECTRICAL AND CONTROL CONDUITS AND WIRING

A. Electrical work and conduits for control shall be in accordance with Division 16.

B. Control wires shall conform to the following wire colors and installation requirements:

   Neutral Wires: White (#12 AWG) - do not interconnect neutral wires between controllers.

   Pilot Wires: #14 AWG

<table>
<thead>
<tr>
<th>Valve No.</th>
<th>Valve No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Yellow</td>
<td>5 Brown</td>
</tr>
<tr>
<td>2 Orange</td>
<td>6 Purple</td>
</tr>
<tr>
<td>3 Blue</td>
<td>7 Yellow w/black stripe</td>
</tr>
<tr>
<td>4 Black</td>
<td>8 Orange w/black stripe</td>
</tr>
</tbody>
</table>

C. Direct burial control wires shall be installed in the conduits.

D. Wire Connections: Neutral, pilot and spare wires shall be installed with a 2-foot coiled excess wire length at each end enclosure. Every wire splice shall be soldered together (using 60-40 solder) then encased in the waterproof epoxy of the connectors. Wire splices shall be made only in valve or pullboxes.

E. Wire Bundles: Each individual controller clock's control wires shall be bundled and taped together with colored tape at intervals not exceeding 10 feet.

F. All wires in pull boxes shall be loose and shall not come within 3 inches of the lid. Boxes shall be sized accordingly to accommodate this requirement.

G. All wiring shall be tested for continuity, open circuits and unintentional grounds prior to connecting to equipment. The minimum insulation resistance to ground shall be 50 mega ohms. Any wiring not meeting this requirement shall be replaced at the Contractor’s expense.
H. Install new control wires and extend existing control wires as required and as shown on the Drawings to complete the work.

I. All new conduits and wires shall be installed to and from the controller as required and as shown on the Drawings.

J. Install new belowground and aboveground pull boxes as required and shown on the Drawings.

3.06 PIPE SLEEVES

A. PVC pipe sleeves shall be provided under all paving and where necessary for passage under finish surface material, future replacement and for protection of PVC piping and control wire.

B. Sleeves shall be two times the pipe size diameter and extend 12 inches beyond each side of pavement.

3.07 CLEANING, TESTING AND STARTUP

A. General:

1. All testing and startup shall be performed in the presence of the Owner.

2. The Contractor shall provide all required material, equipment, and instrument required, including water.

3. All testing shall be performed using clean water.

4. Provide at least two Working Days’ advance notice to the Owner for scheduled testing and startup.

5. Upon completion of the work, make the ground surface level and remove excess materials, rubbish, debris, and equipment from the Site.

B. Irrigation Piping and Valves:

1. After all piping, valves and associated appurtenances have been installed, open control valve to flush out the irrigation system under working pressure. Irrigation heads shall be installed after completion of flushing the system satisfactory to the Owner.

2. Piping system shall be tested at 50 psi for leakage. Any defects or deficiencies found in the system shall be corrected by the Contractor at no additional cost to the Owner. Backfilling of trenches shall be performed after pressure test is successfully completed.
3. Adjust all irrigation heads, control valves, pressure regulators, etc. for optimum performance.

C. Irrigation Controller:

1. Test irrigation controller for satisfactory operations.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and install chain link fences and gates as shown on the drawings, as specified herein, and as required to complete the work.

1.02 RELATED WORK

A. Earthwork is included in Section 02 20 00.

B. Concrete Work is included in Section 03 30 00.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01 32 19, Shop Drawings showing dimensions layouts and details of construction and accessories required. Submittals shall include the following:

1. Product data, including manufacturer’s technical data, specifications and installation instructions.

2. Shop Drawings, dimensions, thickness, details, and technical data for all fence components to be provided. These include, but not limited to, pipes, posts, fabric, coating systems, braces, rails, stretcher bars, truss rods, tension wire, top and bottom fabric wire condition, dimension of fabric to finish grade, footings,

3. Shop Drawings, dimensions, thickness, details, and technical data for all gate components to be provided. These include, but not limited to, frame, bracings, tension bars, posts, rails, fabric, locking mechanism, latches, center drop bolt, top and bottom fabric wire condition, dimension of fabric to finish grade, and footings.

4. Fence and gate location and layout plans.
1.04 REFERENCE STANDARDS

A. American Standards for Testing and Materials (ASTM)

1. A121 - Standard Specification for Metallic-Coated Carbon Steel Barbed Wire


3. A824 - Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use With Chain Link Fence

4. C387 - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar

5. F567 - Standard Practice for Installation of Chain-Link Fence

6. F626 - Standard Specification for Fence Fittings

7. F654 - Standard Specification for Residential Chain Link Fence and Gates

8. F668 - Standard Specification for Polyvinyl Chloride (PVC), Polyolefin and Other Polymer-Coated Steel Chain Link Fence Fabric


10. F934 - Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials


12. F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

13. F1664 - Standard Specification for Polyvinyl Chloride (PVC) and Other Conforming Organic Polymer-Coated Steel Tension Wire Used with Chain-Link Fence

14. F1665 - Standard Specification for Polyvinyl Chloride (PVC) and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used with Chain Link Fence
PART 2 - PRODUCTS

2.01 FENCE MATERIALS

A. Posts, braces, rails, stretcher bars, truss rods, and tension wire shall be made of steel. Post caps, tops, rail ends, ties, clips, stretcher bar bands, and other parts shall be of hot dipped galvanized steel.

1. Intermediate posts, terminal posts, braces and rails shall be Type I round, hot dipped galvanized with a minimum average zinc (Grade E) coating of 1.8 oz/sf meeting ASTM F1083 for standard weight (Schedule 40) galvanized pipe. Dimensions shall conform to the following:

<table>
<thead>
<tr>
<th>Use and Section</th>
<th>Nominal Outside Diameter (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>End, Corner and Pull Posts with Fabric Height 6 Feet</td>
<td>2.875</td>
</tr>
<tr>
<td>Rails &amp; Post Braces</td>
<td>1.66</td>
</tr>
<tr>
<td>Intermediate Posts with Fabric Height 6 Feet</td>
<td>2.375</td>
</tr>
</tbody>
</table>

2. Post braces shall be provided for each corner, pull, and end post with fabric 6 feet or more in height, and shall consist of a round tubular brace extending to each adjacent line post at approximately mid-height of the fabric and a truss consisting of a rod not less than 5/16-inch nominal diameter from the line post back to the corner, pull, or end post with a turnbuckle or other equivalent provision for adjustment. Rail truss panels shall be used to join corner posts in both directions. Rail truss panels shall be used at all corners, end posts and angle points or curves with deflection angles greater than 15 degrees.

3. Post tops shall consist of a hole suitable for the through passage of the top rail and shall fit over the outside of posts, excluding moisture from inside of posts.

4. All fences shall have continuous top rails. Rails shall consist of lengths not greater than 18 feet and shall be fitted with hot dipped galvanized steel sleeves or couplings for connecting the lengths into a continuous run. Couplings shall not be less than 6 inches long with 0.070-inch minimum wall thickness and shall allow for expansion and contraction of the rail. Means shall be provided for attaching the top rail to each corner, pull, and end post.

5. Tension bars shall not be less than 3/4-inch and not less than 2 inches shorter than normal height of fabric to which they are attached. Provide one tension bar for each end and two bars for each corner and pull post.
6. Tie fasteners shall PVC coated be 6-gauge steel wire similar to fence fabric. Tie fasteners wire shall be used to attach fabric securely to all line posts at intervals not exceeding 15 inches. Tie fasteners shall be attached securely to the top rail at intervals not exceeding 18 inches.

7. Bands of galvanized steel per ASTM F626 shall be provided for attaching fabric and stretcher bars to all terminal posts at intervals not exceeding 12 inches. Bands shall have a minimum thickness after galvanizing of 0.078-inch and minimum width of 3/4-inch for posts 4 inches OD or less and 0.108-inch thick by 7/8-inch for posts larger than 4 inches. Attachment bolts shall be 5/16-inch by 1 1/4-inch galvanized carriage bolts with nuts.

8. Tension wire shall be No. 7 gauge conforming to ASTM A824 with zinc-coating Class 2, 1.20 oz/sf. Tension wire shall be provided at the bottom of the fabric.

B. PVC Coated Fabric:

1. PVC coated fabric shall conform to ASTM F668.

2. Fabric Shall be Class 2 consist of PVC fusion-bonded to zinc-coated steel wire.

3. PVC coating thickness for fusion-bonded process shall be at least 8 mils.

4. PVC coating color shall be green as approved by the Owner.

5. Steel wire diameter shall be at least 0.148 inch. Weight of the zinc coating on steel wire shall not be less than 2.0 oz/sq ft of uncoated wire surface.

6. Fabric shall be woven into 2-inch mesh.

7. Height shall be as shown on the Drawings, with overall dimension measured from ends of twists with tolerances of plus or minus 1 inch.

8. Fabric on fences 72 inches high and over shall be knuckled at the bottom selvage and twisted on the top selvage. On fences less than 72 inches in height, top and bottom selvages shall be knuckled.

C. Barbed wire and support arms shall be in accordance with Paragraph 2.03.

2.02 GATE MATERIALS

A. Gates shall conform to ASTM F900 and as supplemented herein.
B. Gates shall provide clear openings as shown on the Drawings. Size of the gate opening shall be measured from the inside face to inside face of gate posts. Unless otherwise noted, gates shall be 6 feet high minimum (excluding barbed wire extension on top) and shall have heavy malleable iron extension arms.

C. Gate structure shall be designed by the manufacturer to provide a sturdy gate with allowable specified maximum sagging. The gate components shall be adequately designed to withstand all applicable loads and all applicable state and local codes and regulations. These shall include, but are not limited to, frame, posts, hinges, internal bracings, tension rods, hardware, concrete foundation, etc. Gate members shall not be less than specified herein. Larger members shall be provided as required by the manufacturer.

D. Gate Frame:

1. Base materials of the gate frame shall be round tubular members, welded at all corners or assembled with corner fittings. Members shall be galvanized steel, schedule 40 minimum.

2. Members:
   a. Tubular members with minimum nominal 1-1/2 inch diameter, 1.900 inch O.D.
   b. Interior horizontal and vertical bracing, when needed, shall be the same metal and shape tubular material and finish as the frame. The minimum size of internal bracing shall be nominal 1-1/4 inch diameter, 1.660 inch O.D.
   c. Diagonal tension bars (rods) shall be provided as needed.
   d. Corner fittings shall have adjustable truss rods 5/16-inch minimum diameter on panels 5 feet wide or wider and constructed of the same base metal and finish as the frame.
   e. Gate frame, bracings, and tension bars shall be zinc-coated steel in accordance with ASTM F1043 and F1083 and shall match adjoining fence framework.

3. Gate leaves shall have vertical interior bracing at maximum intervals of 5 feet and shall have a horizontal interior member if the fabric height is 5 feet or more.

4. Outer members shall not sag in excess of the lesser of 0.75 percent of the gate leaf width or 1.5 inches, whichever is smaller. Framing members and
bracings shall be sized accordingly. Gate not meeting this requirement will be rejected.
E. Gate Posts:

1. Size:

   a. For gates with total clear opening between 19 and 28 feet, gate posts shall be nominal 8 inches, 8 5/8-inch O.D.

   b. For gates with total clear opening between 10 and 18 feet, gate posts shall be nominal 6 inches, 6 5/8-inch O.D.

   c. For gates with total clear opening between 4 and 10 feet, gate posts shall be nominal 3 1/2 inches, 4.00-inch O.D.

   d. For gates with total clear opening 4 feet or smaller, gate posts shall be nominal 2 1/2 inches, 2.875-inch O.D.

2. Gate posts shall be hot dipped galvanized with minimum average zinc (Grade E) coating of 1.8 oz./sq. ft. meeting ASTM F1083 for standard weight (Schedule 40) galvanized pipe.

3. Embedment Length of Gate Posts:

   a. For nominal 8” and 6” diameter posts, embedment length in concrete foundation shall be 48” minimum.

   b. For nominal 3 1/2” diameter post, embedment length in concrete foundation shall be 42” minimum.

   c. For nominal 2 1/2” diameter post, embedment length in concrete foundation shall be 36” minimum.

F. Gate fabric, barbed wire supports and barbed wires shall be the same as for fence.

G. Hinges shall be structurally capable of supporting the gate leaf and allow the gate to open and close without binding and designed to permit the gate to swing a full 180 degrees.

H. Provide stops and keepers for all double gates. Latches shall have a plunger bar arranged to engage the center stop. Arrange latches for locking. Center stops shall consist of a device arranged to be set in buried concrete pier/block and to engage a plunger bar. Keepers shall consist of a mechanical device for securing the free end of the gate when in full open position. Arrange latches for padlocking so that padlock will be accessible from both sides of the gate regardless of the latching arrangement.
I. Accessories shall be of the same materials as specified for the fence.

J. Barbed wire and support arms for gate shall be in accordance with Paragraph 2.03.

2.03 BARBED WIRE AND SUPPORT ARMS

A. Posts shall be topped with v-shaped arms. The support arm shall be of one-piece construction and capable of withstanding a weight of 250 pounds applied at the outer strand of barbed wire with no permanent deformation.

B. Support arms shall be pressed copper-bearing galvanized steel extension arms and heavily coated with zinc by the hot-dip process. Each extension arm shall be sized to carry three strands of barbed wire at an angle of 45 degrees, the upper strand 12 inches out from the fence line and 12 inches above the top of the fabric. Arms shall be the type that allow top rail to pass through their bases to form a continuous brace.

C. Barbed wire arms shall be securely bolted or fastened to the post tops. Strands shall consist of 12 1/2-gauge copper-bearing wire, twisted with 4 point 14-gauge hard tempered barbs spaced not more than 3 inches apart and heavily galvanized by the hot-dip process.

D. Install barbed wire and support arms on all fences and gates.

2.04 PAINTING AND COATING

A. Coating for fence and gate fabric shall be fusion-bonded PVC coating per Paragraph 2.01.B.

B. Steel Fence and Gate Framing:

1. In accordance with ASTM F1043, apply supplemental color coating of minimum 10 mils of thermally fused polyvinyl chloride in conjunction with all coatings as indicated.

2. Coating color shall be green similar to fence fabric color and as approved by the Owner.

C. Chain Link Fence and Gate Accessories:

1. Provide items required to complete fence systems with fusion-bonded coating per applicable ASTM standards.
2. Tension wire: Tension wire shall be PVC Class 2b fused-bonded per ASTM F1664.

3. Barbed Wire: Barbed wires shall be fused polymer-coated per ASTM F1665 Class 2b.

4. Threaded fittings need not be PVC-coated, but field-coated per manufacturer's recommendations.

5. Unless otherwise indicated, color of the coating of all accessories shall match color of fence fabric and as approved by the Owner.

2.05 CONCRETE

A. Concrete shall be 3,000 psi minimum concrete in accordance with Section 03 30 00.

B. Concrete shall be provided for fence post foundation, gate post foundation, center stop, keepers, and other similar components.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install fence to comply with ASTM F567.

B. Install fencing as shown on the Drawings and in accordance with approved shop drawings.

C. Remove and/or trim existing vegetation including plants, shrubs, trees interfering with installation as required and approved by the City. Alignment of fence may be slightly altered to avoid major obstacles as approved by the City.

D. Do not begin installation and erection before final grading is completed unless otherwise permitted, except for temporary construction fencing.

E. Install posts in accordance with Paragraph 3.02.

F. Place fabric on the outside of the framework of the area to be enclosed.

G. Place fabric by securing one end, applying sufficient tension to remove all slack before making attachments elsewhere. Tighten the fabric to provide a smooth uniform appearance free from sagging. The fabric can be cut by untwisting a picket and attaching each span independently at all terminal posts. Use stretcher bars with tension bands at 15-inch maximum intervals. Fabric shall
be installed a maximum 2 inches above finished grade. Fasten fabric with ties to line posts at intervals not exceeding 15 inches. Fasten fabric to rails with ties at intervals not exceeding 18 inches. Rolls of wire fabric can be joined by weaving a single picket into the ends of the rolls to form a continuous mesh.

H. End, corner and pull post bracing with a center rail shall be required on all fencing over 6 feet in height.

3.02 SETTING POSTS

A. Space fence posts not more than 10 feet on center. Align posts vertically and align tops. Space gate posts as required to provide specified clear opening.

B. All fence posts shall be set 36 inches deep inside concrete foundation. Gate post’s embedment length in concrete foundation shall be in accordance with Paragraph 2.02.E.3.

C. Concrete Foundation:

1. The minimum diameter of concrete foundation shall be 12" for fence post and gate post with nominal diameter 2 ½".

2. The minimum diameter of concrete foundation shall be 15" for fence post and gate post with nominal diameter 3 ½".

3. The minimum diameter of concrete foundation shall be 18" for fence post and gate post with nominal diameter 6” and 8”.

4. Concrete foundation for all posts shall extend 6 inches minimum below the bottom of the posts and 2 inches above the finished grade. Provide trowel finish at top and 1” high crown at center to shed water. Excavations for concrete encasement shall be made in undisturbed soil or compacted backfill.

D. On concrete or masonry wall, fence posts shall be installed in stainless steel sleeves embedded in the middle of wall. Unless otherwise shown, inside diameter of the sleeve shall be 1/2 inch larger than the post outside diameter. Length of the sleeve shall be 12-inch minimum. Half-fill the sleeve with non-shrink epoxy grout, force the post to the bottom of the sleeve, and plumb. Thoroughly work additional epoxy grout into the hole so as to leave no voids. Crown the grout to shed water.

3.03 TOP RAILS

Run top rail on all fences continuously through line post caps with expansion couplings placed maximum 18 feet on center.
3.04 **BRACE ASSEMBLIES**

Install braces at end, at both sides of corner, and at both sides of grade change with 5% or larger grade change. Pull posts so posts are plumb when diagonal rod is under proper tension.

3.05 **BOTTOM TENSION WIRE**

Install bottom tension wire within 6 inches of bottom of fabric and weave through the stretched portion of fence running tension wire from end to end of each stretch of fence. Fasten to fabric with 0.120-inch diameter (11-gauge) hog rings spaced not more than 18 inches on center. Tension wire shall be taut and free of sag.

3.06 **BARBED WIRE AND SUPPORT ARMS**

A. Install barbed wire support arms on all posts. Support arm shall be at an angle of 45 degrees, the upper strand 12 inches out from the fence line and 12 inches above the top of the fabric.

B. Install barbed wire on supporting arms above the fence posts. Pull each strand taut and securely fasten to each supporting arm and extended member.

C. Install barbed wire and support arms on all fences and gates.

3.07 **GATE**

A. Install gates to meet the requirements of ASTM F567 and according to manufacturer's instructions, plumb, level and secure for full 180 degree opening without interference.

B. Hinges shall be constructed to allow the gate to open and close without binding.

C. Set keepers, stops and other accessories into concrete as required by the manufacturer. Adjust hardware for smooth operation and lubricate where necessary.

D. Install 8 inches square and 12 inches deep concrete block with 1 ½” diameter PVC sleeve to receive cane bolt. Top of concrete block shall be flush with the adjacent finished grade.

3.08 **COATING REPAIR**
A. Use galvanized repair compound, stick form, or other method, where galvanized surfaces need field or shop repair. Repair surfaces in accordance with the manufacturer's printed directions.

B. Repair damaged coating in field in accordance with manufacturer's recommendations and to the satisfaction of the Owner.

END OF SECTION
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SECTION 02 99 00
MISCELLANEOUS WORK

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform miscellaneous work not specified in other sections but necessary for the proper completion of the work as per the Contract Documents.

B. When applicable, perform the work in accordance with other related Sections. When no applicable specification exists, perform the work in accordance with the best modern practice and/or as directed by the City.

C. The work of this Section includes, but is not limited to, the following:

1. Crossing and relocating existing utilities
2. Restoring driveways and sidewalks
3. Cleaning up
4. Incidental work
5. Protection and/or removal and reinstallation of signs, lampposts and mailboxes
6. Restoration and replacement of curbing
7. Protection and bracing of utility poles
8. Restoring easement and right-of-ways

PART 2 - PRODUCTS

2.01 MATERIALS

Materials required for this Section shall be the same quality of materials that are to be restored. Where feasible and as approved by the City or agency having jurisdiction, reuse existing materials that are removed.
PART 3 - EXECUTION

3.01 CROSSING AND RELOCATING EXISTING UTILITIES

Perform work required in crossing culverts, watercourses including brooks, drainage ditches, storm drains, gas mains, water mains, electric, telephone, gas and water services and other utilities. This work shall include bracing, supporting, hand excavation, backfill and any other work required for crossing the utility or obstruction. The Contractor shall notify the utility companies and the City at least 14 calendar days in advance.

3.02 RESTORING DRIVEWAYS AND SIDEWALKS

A. Existing public and private driveways disturbed by the construction shall be replaced at the Contractor’s expense. Paved drives shall be repaved to the limits and thicknesses existing prior to construction. Gravel drives shall be replaced and regraded in kind.

B. Existing public and private sidewalks disturbed by the construction shall be replaced with sidewalks of equal quality and dimension at the Contractor’s expense.

3.03 CLEANING UP

Remove all construction material, excess excavation, buildings, equipment and other debris remaining on the job as a result of construction operations and restore the site of the work to a neat and orderly condition.

3.04 INCIDENTAL WORK

Do all incidental work not otherwise specified, but necessary to the proper completion of the work as specified in the Contract Documents.

3.05 REMOVAL AND REPLACEMENT OF SIGNS, LAMPPPOSTS AND MAILBOXES

Existing signs, lampposts and mailboxes that may be damaged or removed during the course of installing the new pipelines or other facilities shall be promptly reinstalled in a vertical position at the same location from which they were removed. Replace damaged items with items of equal or better quality than the damaged items. Provide a concrete anchor as necessary to ensure a rigid alignment. Exercise care in the reinstallation of all items to prevent damage to the newly installed pipelines. Traffic signs shall be installed in accordance with the applicable jurisdictional standards and to the satisfaction of the agency having jurisdiction.
3.06 RESTORATION AND REPLACEMENT OF CURBING

Existing concrete or bituminous curbing shall be protected. If necessary, curbing shall be removed and replaced after backfilling. Curbing which is damaged during construction shall be replaced with curbing of equal quality and dimension. Joints between sections shall be pointed as required after resetting. Bituminous berms shall conform to governing agency standards and requirements.

3.07 PROTECTION AND BRACING OF UTILITY POLES

Make all arrangements with the proper utility companies for bracing and protection of all utility poles that may be damaged or endangered by the operations. Work under this item shall include the related removal and reinstallation of guy wires, or support poles whether shown on the Drawings or not.

3.08 RESTORING EASEMENTS AND RIGHTS-OF-WAY

A. The Contractor shall be responsible for all damage to public and private property due to his operations. Protect from injury all walls, fences, cultivated shrubbery and vegetables, trees, pavement, underground facilities, such as water, gas and electrical lines, or other utilities that may be encountered during the course of work. If removal and replacement are required, it shall be done in a workmanlike manner so that replacement is equivalent to that which existed prior to construction.

B. Existing lawn and sod surfaces damaged by construction shall be replaced. Cut and replace the lawn and sod, or restore the areas with an equivalent depth and quality of loam, seed and fertilizer as necessary to produce a stand of grass at least equal to that existing prior to construction. These areas shall be maintained and resodded or reseeded, if necessary, until all work under this Contract has been completed and accepted. Any additional work required to restore property to the original condition shall be performed.

C. Existing trees, shrubs, plants and bushes shall be fully protected unless otherwise noted. The work shall also include removing and replacing those trees, shrubs and bushes as indicated on the Drawings. It shall include the careful excavation of the rootball, which shall be wrapped with burlap while out of the ground. Replant after backfilling the trench, stake in an upright position; and periodically water replanted trees, bushes and shrubs. Contractor shall be fully responsible for ensuring that any and all trees, bushes and shrubs removed and replanted "take" and return to a viable state. Any replanted item that fails to "take" or that is so damaged as to be unsuitable for replanting shall be replaced, at no additional cost to the City, with a tree, bush or shrub equal in
type and size to the one removed.

D. All plants shall be guaranteed for not less than 1 full year from the time of provisional acceptance.

1. At the end of this period, any plant that is missing, dead, or not in satisfactory growth, as determined by the City, shall be replaced.

2. All replacements shall be plants of the same kind and size. They shall be furnished and planted as specified herein. The cost of replacement shall be borne by the Contractor except where it can be definitely shown that loss resulted from vandalism or the City's failure to maintain planting as instructed.

END OF SECTION
SECTION 03 30 00
CONCRETE WORK

PART 1 - GENERAL

1.01 SCOPE OF WORK

The work covered by this section of the specifications consists furnishing all plant, labor, equipment and materials required and performing all operations in connection with all Portland cement concrete work necessary to complete the project.

1.02 RELATED WORK

A. Grout is included in Section 03 60 00.

B. Modifications and Repairs to Concrete are included in Section 03 74 00.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01 32 19, shop drawings and product data showing materials of construction, test reports and details of installation for concrete work, including the following.

B. Reinforcing drawings showing reinforcement material, grade and applicable ASTM standards, bar lists, schedule, bending details, placing plans, elevations and details, concrete cover, splice locations, splice lengths, and additional reinforcement around openings, at corners, etc.

C. Sources of cement, pozzolan, and aggregates.

D. Complete concrete mix design details, including compressive strength, slump, air content, admixtures, constituent quantities per cubic yard, water-cementitious materials ratio, type of cement and contact information for ready mix concrete supplier.

E. Product data, including catalogue cuts, technical data and conformity to ASTM standards for sheet curing material, liquid curing compound, form release agent, form ties, and bond breaker. Identify locations of use of each as applicable.

F. Certified delivery tickets for ready-mix concrete at the time of delivery of each load of concrete.
1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement

2. ASTM A615 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement

3. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement

4. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

5. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field

6. ASTM C33 - Standard Specification for Concrete Aggregates

7. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

8. ASTM C94 - Standard Specification for Ready-Mixed Concrete

9. ASTM C127 - Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate


11. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete


14. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

15. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete

B. American Concrete Institute (ACI)
1. ACI 117 – Specification for Tolerances for Concrete Construction and Materials

2. ACI 301 - Specifications for Structural Concrete

3. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete

4. ACI 304.2R - Guide to Placing Concrete by Pumping Methods

5. ACI 315R - Guide to Presenting Reinforcing Steel Design Details

6. ACI 318 - Building Code Requirements for Structural Concrete

7. ACI SP-66 - ACI Detailing Manual

C. Concrete Reinforcing Steel Institute (CRSI)
   1. Manual of Standard Practice

D. American Plywood Association (APA)
   1. Material grades and designations as specified.

1.05 QUALITY ASSURANCE

A. Reinforced concrete shall comply with ACI 318 and other stated requirements, codes and standards. The most stringent requirement of the codes, standards and this Section shall apply when conflicts exist.

B. Field testing and inspection services will be provided by the City. The cost of such work, except as specifically stated otherwise, shall be paid by the City. Testing of the following items will be performed by the City to verify conformity with this Specifications Section:

1. Concrete placements - compressive strength (cylinders), compressive strength (cores), and slump.

2. Other materials or products that may come under question.

1.06 DELIVERY, STORAGE AND HANDLING

A. Sheet Curing Materials: Store in weathertight buildings or off the ground and under cover.
B. Liquid Curing Compounds: Store in closed containers.

C. Reinforcing steel shall be substantially free from mill scale, rust, dirt, grease, or other injurious contaminants and stored off the ground.

D. Reinforcing steel shall be shipped and stored with bars of the same size and shape fastened in bundles with durable tags, marked in a legible manner with waterproof markings showing the same "mark" designations as those shown on the submitted placing drawings.

PART 2 - PRODUCTS

2.01 GENERAL

A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired. Like items of materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance and manufacturer's service.

B. Materials shall be new and shall comply with this Section and any applicable state or local requirements.

2.02 MATERIALS

A. Cement: Domestic Portland cement complying with ASTM C150. Air entraining cements shall not be used. The following cement type(s) shall be used:

1. All classes of concrete - Type II with all optional characteristics (with low-alkali and moderate heat of hydration) specified in Table 2 of ASTM C150.

B. Fine Aggregate: Washed inert natural sand conforming to the requirements of ASTM C33.

C. Coarse Aggregate: Well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33 Table 2. Size numbers for the concrete mixes shall be as shown in Table 1 herein unless otherwise noted.

D. Water: Water free from injurious amounts of oils, acids, alkalis, salts, organic matter, or other deleterious substances.

E. Admixtures: Admixtures shall be free of chlorides and alkalis (except for those attributable to water). When it is required to use more than one admixture in a concrete mix, the admixtures shall be from the same manufacturer.
Admixtures shall be compatible with the concrete mix including other admixtures.

1. Air-Entraining Admixture: The admixture shall comply with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

2. Water-Reducing Agent: The admixture shall comply with ASTM C494, Type A. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

3. High-Range Water-Reducer (Plasticizer): Plasticizer shall not be used unless approved by the Engineer.

F. Pozzolan (Fly Ash). Pozzolan shall be Class C or Class F fly ash complying with ASTM C618 except the Loss on Ignition (LOI) shall be limited to 3 percent maximum.

G. Sheet Curing Materials. Waterproof paper, polyethylene film or white burlap-polyethylene sheeting all complying with ASTM C171.

H. Liquid Curing Compound. Liquid membrane-forming curing compound shall comply with the requirements of ASTM C309, Type 1-D (clear or translucent with fugitive dye) and shall contain no wax, paraffin, or oil. Curing compound shall be approved for use in contact with potable water after 30 Calendar Days (non-toxic and free of taste or odor).

I. Forms for cast-in-place concrete shall be made of wood, metal, or other approved material.

J. Form Release Agent

   1. Coat all forming surfaces in contact with concrete that will not be painted, using an effective, non-staining, non-residual, water based, bond-breaking form coating unless otherwise noted.

K. Form Ties

   1. Form ties encased in concrete shall be designed so that after removal of the projecting part, no metal shall remain within 1 1/2 inches of the face of the concrete. Form ties in concrete exposed to view shall be the cone-washer types. Common wire shall not be used for form ties.

L. Deformed Concrete Reinforcing Bars: ASTM A706, grade 60 deformed bars. ASTM A615 Grade 60 may be used provided the following requirements are satisfied:
1. The actual yield strength of the reinforcing steel based on mill tests shall not exceed the specified yield strength by more than 18,000 psi. Re-tests shall not exceed this value by more than an additional 3000 psi.

2. The ratio of the actual ultimate tensile strength to the actual tensile yield strength of the reinforcement shall not be less than 1.25.

3. The carbon equivalency (CE) of ASTM A615 bars shall be 0.55 or less.

M. Concrete Reinforcing Bars required on the Drawings to be field bent or welded shall be conforming to ASTM A706.

N. Tie Wire

1. Tie Wires for Reinforcement shall be 14-gauge or heavier, black annealed wire.

O. Welded Steel Wire fabric reinforcement shall conform to the requirements of ASTM A185.

P. Bond Breaker: Bond breaker shall be nonstaining type bond prevention coating such as Williams Tilt-up Compound by Williams Distributors Inc.; Silcoseal 77, by SCA Construction Supply Division, Superior Concrete Accessories; Super Bond Breaker WB by Burke Co., San Mateo, CA; or equal.

Q. Epoxy Bonding Agent: Epoxy bonding agent shall be a two-component, solvent-free, moisture insensitive, epoxy resin material conforming to ASTM C881, Type V. The bonding agent shall be Sikadur 32 Hi-Mod by Sika Corporation of Lyndhurst, NJ; Concresive Liquid (LPL) by Master Builders of Cleveland, OH; or equal.

R. Joint Sealant: Sealants for joints in concrete shall conform to the requirements of Section 07 92 00.

2.03 CONCRETE MIXES

A. General:

1. Concrete shall be composed of Portland cement, fine and coarse aggregates, water and admixtures. These materials shall be of the qualities specified herein. Fly ash may be included in the mix up to 15% the volume of cement.

2. In general, the mix shall be designed to produce a concrete capable of being deposited so as to obtain maximum density and minimum shrinkage and, where deposited in forms, to have good consolidation properties and maximum smoothness of surface.
3. All concrete shall be ready-mixed concrete complying with ASTM C94 except as otherwise permitted by the Engineer.
B. Concrete Mix Requirements:

1. Select proportions of ingredients to meet the design strength and materials limits specified in Table 1 and to produce concrete having proper consistency, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture that will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.

2. The design mix shall be based on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if not available, be developed by laboratory tests. The resulting mix shall not conflict with the limiting values for maximum water cementitious ratio and net minimum cementitious content as specified in Table 1.

<table>
<thead>
<tr>
<th>Table 1 - Concrete Mix Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class B</strong></td>
</tr>
<tr>
<td><strong>Class D</strong></td>
</tr>
<tr>
<td><strong>Design Strength (1)</strong></td>
</tr>
<tr>
<td><strong>Cement (2)</strong></td>
</tr>
<tr>
<td><strong>Fine Aggregate (2)</strong></td>
</tr>
<tr>
<td><strong>Coarse Aggregate (3)</strong></td>
</tr>
<tr>
<td>1 in. to 4 no.</td>
</tr>
<tr>
<td><strong>Cementitious Content (4)</strong></td>
</tr>
<tr>
<td><strong>W/C Ratio (5)</strong></td>
</tr>
<tr>
<td><strong>Fly Ash</strong></td>
</tr>
<tr>
<td><strong>AE Range (6)</strong></td>
</tr>
<tr>
<td><strong>WR (7)</strong></td>
</tr>
<tr>
<td><strong>Slump Range Inches (8)</strong></td>
</tr>
</tbody>
</table>

NOTES:
(1) Minimum compressive strength in psi at 28 days
(2) ASTM designation
(3) Size Number in ASTM C33 – Use smaller size aggregate where noted on the Drawings
(4) Cementitious content in lbs/cu yd
(5) W/C is Water-Cementitious ratio by weight
(6) AE is percent air-entrainment
(7) WR is water-reducer admixture
(8) Slump values listed are for concrete mixes without WR admixture. Maximum slump shall not be more than 5 inches for concrete with WR admixture.
PART 3 - EXECUTION

3.01 FORMWORK

A. Forms shall be surfaced, designed and constructed in accordance with the recommendations of ACI 347 and shall meet the additional requirements as specified herein.

B. Forms shall be used for all cast-in-place concrete including sides of footings except for pipe and conduit encasements where concrete may be placed directly against the side of the trench.

C. The Contractor shall be solely responsible for the adequacy of the forming system. Concrete forms shall conform to the shape, lines, and dimensions of members as called for on the Drawings. Forms shall be substantial, free from surface defects, and sufficiently tight to prevent leakage. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly placed concrete.

D. Provide openings in concrete formwork shown on Drawings or required by other Sections. Pipe embedment and metal items used to support pipe penetrations shall have a minimum clearance of 2 inches from reinforcing steel bars.

E. Form Ties. Holes left by the removal of form tie cones shall be repaired in accordance with Paragraph 3.06.C.

3.02 REINFORCEMENT

A. All reinforcement steel, welded wire fabric, couplers, and other appurtenances shall be fabricated and placed in accordance with the requirements of the applicable codes and the supplementary requirements specified herein. Surface condition, bending, spacing and tolerances of placement of reinforcement shall comply with the CRSI Manual of Standard Practice.

B. Reinforcement steel shall be accurately formed to the dimensions and shapes shown, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318 except as indicated. Bars shall be bent cold. Reinforcing steel bars shall not be field bent or welded except where shown on the Drawings or specifically authorized in writing by the Engineer. Reinforcing bars shall not be welded unless approved by the Engineer in writing.

C. Reinforcing steel bars shall be fabricated such as to avoid interference with the items to be embedded in the concrete, such as, pipes, sleeves, hatch frames,
etc. Shop Drawings shall include additional details, as required, depicting special fabrication requirements to avoid interference with items to be embedded.

D. Reinforcement steel shall be tied using annealed iron wire ties or suitable clips at intersections. For concrete over formwork, the Contractor shall furnish concrete, metal, plastic, or other acceptable bar chairs and spacers as per following:

1. Concrete Dobies: Permitted at all locations except where architectural finish is required.

2. Wire Bar Supports: Permitted only at slabs over dry areas, interior dry wall surfaces, and exterior wall surfaces.

3. Plastic Bar Supports: Permitted at all locations except on grade.

E. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dobies) spaced not more than 3 feet on centers in any direction. The construction practice of placing welded wire fabric on the ground and hooking into place in the freshly placed concrete shall not be used.

F. Except as otherwise indicated on the Drawings, the minimum concrete cover of reinforcement shall be as follows:

1. Concrete cast against and permanently exposed to earth: 3 inches

2. Concrete exposed to soil, water, sewage, sludge and/or weather (cover to be measured from deepest part of architectural reveals):
   a. No. 6 bars and larger: 2 inches
   b. No. 5 bars and smaller: 1 1/2 inches

3. Concrete not exposed to soil, water, sewage, sludge and/or weather:
   a. Slabs (top and bottom cover), walls, joists, shells and folded plate members: 1 inch

G. Spacing of bars shall be as shown on Drawings.

H. Splices of Reinforcement:

1. Reinforcement bar splices shall only be used at locations indicated. When it is necessary to splice reinforcement at points other than where shown, the character of the splice shall be as acceptable to the City.
2. The length of lap for reinforcement bars, unless otherwise indicated, shall be in accordance with ACI 318. Splices in adjacent bars shall be staggered. Splices in two curtains where used shall not occur in the same location. Class
A splices may be used when 50 percent or less of the bars are spliced within the required lap length. Class B splices shall be used at all other locations.

3. Laps of welded wire fabric shall be in accordance with the ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.

3.03 CONCRETE

A. The following (Table 2) are the general applications for the various concrete classes and design strengths and shall be used as a minimum unless otherwise indicated.

<table>
<thead>
<tr>
<th>Class</th>
<th>Design Strength (psi)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>3,000</td>
<td>All unreinforced concrete components, including concrete overlay, concrete fill, ditches, pavements, fence post foundations, flatwork, small pads &amp; duct encasement</td>
</tr>
<tr>
<td>D</td>
<td>4,000</td>
<td>All reinforced concrete components, including walls, slabs on grade, building floor slab, suspended slab systems, beams, columns, footings, ring beams, vaults and all other structural components</td>
</tr>
</tbody>
</table>

B. Concrete shall be ready-mixed concrete produced by industry-accepted equipment. No hand mixing will be permitted. Ready-mix concrete shall be transported to the site in watertight agitator or mixer trucks.

C. The maximum time interval between the addition of mixing water and/or cement to the batch and the placing of concrete in the forms shall not exceed the values shown in Table 3.

<table>
<thead>
<tr>
<th>Air or Concrete Temperature (whichever is higher)</th>
<th>Maximum Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 to 90 Degrees F (27 to 32 Degrees C)</td>
<td>45 minutes</td>
</tr>
<tr>
<td>70 to 79 Degrees F (21 to 26 Degrees C)</td>
<td>60 minutes</td>
</tr>
<tr>
<td>40 to 69 Degrees F (5 to 20 Degrees C)</td>
<td>90 minutes</td>
</tr>
</tbody>
</table>
D. Prior to placing of any concrete on earth surface, such surface shall be thoroughly wetted and kept moist by frequent sprinkling until concrete is placed. The surface shall be firm and free from any debris, mud or standing water at the time of placing concrete. Confirm that reinforcement and other embedded items are securely in place.

E. Joints:

1. Construction Joints:
   a. Provide construction joints only at locations shown on the Drawings or as accepted by the Engineer.
   b. Any additional or relocation of construction joints proposed by the Contractor must be submitted to the Engineer for written acceptance.
   c. Unless otherwise shown on the Drawings, continue reinforcing steel through the joint.
   d. At all construction joints and at concrete joints designated on the Drawings to be “roughened,” uniformly roughen the surface of the concrete to full amplitude (distance between high and low points or side to side) of approximately 1/4-inch with suitable tools to expose a fresh face. Thoroughly clean joint surfaces of loose or weakened materials by waterblasting or sandblasting and prepare for bonding. Before the new concrete is deposited, the joints shall be saturated with water.
   e. Provide waterstop at construction joints as shown on the Drawings. Additionally, waterstop shall be provided at all below-grade construction joints in walls and slabs to prevent infiltration of groundwater into structure. Unless otherwise shown waterstop shall be installed in the middle of the construction joint.
   f. If shown on the Drawings, install groove at the construction joint with sealant.

2. Control Joints:
   a. Provide control joints at locations shown on the Drawings. Groove size shall be as shown on the Drawings. If shown on the Drawings, install sealant in the groove.
   b. If not shown on the Drawings or not specified elsewhere, the control joints shall be provided as follows.
• Spacing: 10’ to 12’ for walkways and 15’ to 30’ for slabs on grade or walls.

• Member with Reinforcement in Middle:
  ✓ Groove: V-shaped groove, 3/8” wide minimum and 1/2” wide maximum at top.
  ✓ Depth of Cut: 1/5th of the thickness slab or wall with reinforcement in the middle.
  ✓ Provide sealant in groove.

• Member with Reinforcement in Two Curtains:
  ✓ Groove: 3/8” wide x 1 ¼” deep minimum and 1 ½” deep maximum.
  ✓ Do not cut slabs and walls with reinforcement in two curtains (provide only groove).
  ✓ Provide backer rod and sealant in groove.

• Sealant and Backer Rod: Per Section 07 92 00.

3. Expansion Joints:
   a. Provide expansion joints at interface of hardened concrete structure and new fresh concrete and at locations shown on the Drawings.
   b. Place 1/2-inch thick preformed expansion joint material between two surfaces prior to placing new concrete.

F. Deposit concrete as near its final position as possible to avoid segregation. Place concrete continuously at a rate that ensures the concrete is being integrated with fresh plastic concrete. Place concrete in forms using tremie tubes and taking care to prevent segregation. Bottom of tremie tubes shall preferably be in contact with the concrete already placed. Do not permit concrete to drop freely more than 4 feet.

G. All concrete shall be consolidated using mechanical vibrators, puddling, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, embedded items and openings and into corners of forms. Do not over vibrate so as to segregate concrete.

H. Curing Methods for Concrete Surfaces: Cure concrete after placement using one of the following methods:
   1. Water Curing: Keep entire concrete surface wet by ponding, continuous sprinkling or covered with saturated burlap. Burlaps shall be kept damp throughout the curing period. Begin wet cure as soon as concrete attains
an initial set and maintain wet cure 24 hours a day. Provide water curing for a minimum of 10 Calendar Days.

2. Liquid Membrane Curing: Apply curing compound over the entire concrete surface except for surfaces to receive additional concrete. Curing compound shall be applied as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can be absorbed into the concrete. Application of curing compound shall be in compliance with the manufacturer’s recommendations.

I. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has attained strength of at least 30 percent of its specified design strength.

J. Shores shall not be removed until the concrete has attained at least 75 percent of its specified design strength and also sufficient strength to support safely its own weight and construction live loads.

3.04 CONCRETE FINISH

A. All concrete surfaces shall conform accurately to shape, alignment, and grade shown on the Drawings. Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing or roughness of any kind and shall present a finished, smooth and continuous hard surface.

B. Repair holes left by tie rod cones and small imperfections as per Paragraph 3.06.C.

C. Horizontal concrete surfaces of slabs shall have machine or hand floated finish.

D. Provide broom finish perpendicular to direction of traffic for concrete walkways and stairs.

3.05 FIELD INSPECTION AND TESTING

A. In no case shall any reinforcing steel be covered with concrete until the installation of the reinforcement, including the size, spacing and position of the reinforcement, has been observed by the City. The City shall be given a minimum of 24 hours prior notice of the readiness of placed reinforcement for observation. The forms shall be kept open until the City has finished observations of the reinforcing steel.

B. The City shall be notified when the forms are complete and ready for inspection at least 24 hours prior to the proposed concrete placement.
C. Placing and curing of concrete shall be subject to the inspection by the City at all times.

D. Sets of field control cylinder specimens will be taken by the City during the progress of the work, in compliance with ASTM C31. Concrete test cylinders taken of each class of concrete placed each day shall not be less than one set per day,

1. A "set" of test cylinders consists of four cylinders: one to be tested at 7 Calendar Days and two to be tested and their strengths averaged at 28 Calendar Days. The fourth cylinder may be used for a special test at 3 Calendar Days or to verify strength after 28 Calendar Days if 28 Calendar Day test results are low.

E. Cooperate in the making of tests by allowing free access to the work for the selection of samples, providing an insulated closed curing box for specimens, affording protection to the specimens against injury or loss through the operations and furnishing material and labor required for the purpose of taking concrete cylinder samples. All shipping of specimens will be paid for by the City. Curing boxes shall be acceptable to the City.

F. Slump tests will be made in field immediately prior to placing the concrete in accordance with ASTM C143. If slump is greater than the specified range, the concrete shall be rejected.

3.06 CARE, PATCHING AND REPAIRS

A. It is the intent of this Section to require quality work including adequate forming, proper mixture and placement of concrete and curing so completed concrete surfaces will require no patching. Patching and repair work for holes and honeycombed areas shall be performed as specified herein. Any other modifications or repair work required for defective concrete, as determined by the Engineer, shall be performed as directed by the Engineer.

B. The Contractor shall protect all concrete from damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance. Any concrete found to be damaged or which may have been originally defective or becomes defective prior to final acceptance of the work or which departs from line or grade or which for any other reason does not conform to these Specifications shall be satisfactorily repaired or removed and replaced by the Contractor at his expense.

C. Immediately after removal of forms, remove plugs and break off metal ties. Promptly fill holes upon stripping as follows: Moisten the hole with water, followed by a 1/16-inch brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1 to 1.5 mixture of cement and concrete sand mixed slightly damp to the touch (just short of
"balling"). Hammer the grout into the hole until dense, and an excess of paste appears on the surface in the form of a spider web. Trowel smooth with heavy pressure. Avoid burnishing.

D. Honeycombed areas as determined by the City shall be repaired, or completely removed and replaced as directed by the City. In no case will extensive patching of honeycombed concrete be permitted.

1. Remove honeycombed and defective concrete to sound concrete and 1-inch minimum depth. The sides of all removal and repair shall be square.

2. Patch small areas by applying an epoxy bonding agent and then packing the void with non-shrink grout. Finish flush with surrounding concrete.

3. If concrete removal results in cavities exceeding 3-inch in depth and 1 square foot in area, first apply an epoxy bonding agent. Then pack the void with 5,000 psi concrete. Form surfaces as required to prevent sagging. Finish flush with the surrounding concrete.

END OF SECTION
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SECTION 03 40 00
PRECAST CONCRETE MANHOLES AND BOXES

PART 1 - GENERAL

1.01 SCOPE OF WORK

The work of this Section includes providing precast concrete manholes for access manhole structures, blow offs, pull boxes, and related appurtenances as shown on the Drawings, as required by other Sections of these Specifications, as specified herein and as needed for a complete and proper installation.

1.02 RELATED WORK

A. Earthwork is included in Section 02 20 00.
B. Concrete Work is included in Section 03 30 00.
C. Precast Concrete Utility and Drain Structures are included in Section 03 45 00.
D. Metal Work - General Provisions are included in Section 05 50 00.
E. Waterproofing is included in Section 07 90 00.

1.03 SPECIFICATIONS AND STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO)
B. American Society for Testing and Materials (ASTM)
   1. ASTM A48 Standard Specification for Gray Iron Castings
   2. ASTM C150 Standard Specification for Portland Cement
   3. ASTM C478 Standard Specification for Circular Precast Reinforced Concrete Manhole Sections

1.04 SHOP DRAWINGS

A. The following shall be submitted in compliance with Section 01 32 19:
   1. Design criteria, calculations and detailed drawings of manhole component sections.
2. Shop drawings, including layout for pre-cast members, reinforcement, steps, inserts, joints, and hardware.

3. Concrete mix design.

4. Shop Drawings of cast iron frames, grates and covers, steel grates and covers, and all appurtenances.

### 1.05 INSPECTION

After installation, the Contractor shall demonstrate to the City that all manholes and boxes have been properly installed, level, with tight joints, and at the correct elevations.

**PART 2 - PRODUCTS**

### 2.01 DESIGN CRITERIA

A. Precast concrete manhole risers, grade rings, tops, cones, and base sections and precast concrete boxes shall be designed and constructed in accordance with the requirements of ASTM C478 and as follows.

B. Live Load: AASHTO loading class HS-20-44 unless otherwise specified.

C. The minimum sizes of components shall be as shown in the Contract Documents. Larger sizes of components shall be provided as required based on the calculations.

### 2.02 PRECAST SECTIONS

A. Cement: ASTM C150, Type II, Low Alkali.

B. Concrete: Compressive strength – 4,000 psi minimum at 28 Calendar Days.

C. Cone Section: Eccentric taper, unless otherwise shown.

D. Lifting Eye: As required, but not less than one for each section/component.

E. Section Joints:

1. Precast section joints shall be sealed using one of the following methods.

   a. Use cement mortar for joining manhole and box sections. Cement mortar shall consist of 1 part cement to 2-1/2 parts of sand by volume.
b. Precast section joints shall be formed entirely of concrete employing a round, wedge shaped profile gasket, Press Seal Type TP or equal, and when assembled shall be self-centering and make a uniform watertight joint conforming to ASTM C 443. The joint shall also be sealed with a bituminous mastic joint sealing compound such as Concrete Sealants, Inc. “Con Seal,” or equal.

F. Exterior and interior of manhole shall have waterproofing applied in conformance with Section 07 90 00.

2.03 FRAMES AND COVERS

A. Manhole Frames and Covers:

1. Manhole frames and covers shall be non-rocking and shall conform to the requirements of ASTM A48, Class 30.

2. Manhole frames and covers shall be vandal proof, water tight, traffic rated and heavy-duty cast iron type. Cover with parkway rating shall be provided only at locations specifically designed for parkway rating on the Drawings.

3. Manhole clear opening shall be as specified on the Drawings.

4. Vandal proof manhole cover shall be secured with eight stainless steel bolts minimum. Provide continuous neoprene gasket.

5. Manhole cover shall be inscribed with “City of Thousand Oaks – Water”.

6. Coating shall be bituminous black paint.

7. Cover shall have two 1-inch vent holes.

8. Provide continuous ¼-inch diameter neoprene “O” ring between frame and cover.

9. Imported covers and frames shall have the country of origin marking in compliance with federal regulations.

B. Cast iron grates and frames shall conform to the requirements of ASTM A48, Class 30.

C. Steel grates, covers and frames shall be galvanized and conform to the requirements of Sections 05 50 00 and 05 53 00.
2.04 STEPS/RUNGS

A. Steps shall be provided in all structures. Step shall conform to the requirements of ASTM C-478.

B. Steps shall be in accordance with Section 05 51 50.

2.05 MANUFACTURERS

A. Products shall be manufactured as shown on the Standard Drawings, or if not indicated, by one of the following (or equal):

1. Manhole Sections: Ameron; Utility Precast, Inc.

2. Boxes: Armorcast Only, no substitute

3. Frames and Covers: Alhambra Foundry; Neenah Foundry Co.; Vulcan Foundry, Inc.

   a. Unless otherwise specified, 30-inch diameter manhole shall be Model A-1252B, 36-inch diameter manhole shall be Model A-1251B and 42-inch diameter manhole shall be Model A-1323 of Alhambra Foundry or approved equivalent.

   b. Unless otherwise indicated 36-inch manhole access cover and frame shall be provided.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Precast concrete manholes and boxes shall be installed in strict conformance with the manufacturer's written instructions and additionally as shown on the Standard Drawings and Drawings.

B. Manhole and box foundations shall be installed “in the dry” condition on 6 inches minimum of Caltrans Class II aggregate base material compacted to 95% relative density.

C. Manhole and box joints for joining sections shall be mortared both inside and outside.

D. Apply waterproofing coatings in accordance with Section 07 90 00.
3.02 INSPECTION

Upon request, the Contractor shall provide the City adequate ventilation and a workman with ladder or other safe and adequate means for inspection access.

END OF SECTION
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SECTION 03 45 00

PRECAST CONCRETE UTILITY AND DRAIN STRUCTURES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The work of this Section includes providing precast concrete utility and drain structures and related appurtenances as shown on the Drawings, as required by other Sections of these Specifications, as specified herein and as needed for a complete and proper installation.

B. Precast concrete structures shall be provided only where indicated on the Drawings. All other concrete structures shall be cast in place. Unless otherwise indicated on the Drawings, catch basins and drain boxes not larger than 5’ x 5’ x 5’ may be constructed using precast concrete meeting the requirements of the Contract Documents, including Drawings.

1.02 RELATED WORK

A. Earthwork is included in Section 02 20 00.

B. Concrete Work is included in Section 03 30 00.

C. Precast Concrete Manhole and Boxes are included in Section 03 40 00.

D. Metal Work - General Provisions are included in Section 05 50 00.

E. Metal Gratings and Cover Plates are included in Section 05 53 00.

1.03 SPECIFICATIONS AND STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO)
   1. Specifications for Highway Bridges

B. American Concrete Institute (ACI)
   1. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
   2. ACI 304R Guide for Measuring, Mixing, Transporting and Placing Concrete
3. ACI 305R Guide to Hot Weather Concreting
4. ACI 306R Guide to Cold Weather Concreting
5. ACI 309R Guide for Consolidation of Concrete
6. ACI 318 Building Code Requirements for Structural Concrete

C. American Society for Testing and Materials (ASTM)
1. ASTM A36 Standard Specification for Carbon Structural Steel
2. ASTM A48 Standard Specification for Gray Iron Castings
3. ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
4. ASTM A706 Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
5. ASTM A1064 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
6. ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
7. ASTM C33 Standard Specification for Concrete Aggregates
8. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
9. ASTM C42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
10. ASTM C94 Standard Specification for Ready-Mixed Concrete
12. ASTM C192 Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
13. ASTM C231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
15. ASTM C478 Standard Specification for Circular Precast Reinforced Concrete Manhole Sections

16. ASTM C494 Standard Specification for Chemical Admixtures for Concrete

17. ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

18. ASTM 857 Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

19. ASTM 858 Standard Specification for Underground Precast Concrete Utility Structures

20. ASTM C891 Standard Practice for Installation of Underground Precast Concrete Utility Structures

D. American Welding Society (AWS)

1. AWS D1.1 - Structural Welding Code – Steel

2. AWS D1.4 - Structural Welding Code – Steel Reinforcing Bars

E. Concrete Reinforcing Steel Institute (CRSI)

1. Manual of Standard Practice

F. National Precast Concrete Association (NPCA)

1. NPCA QC Manual Quality Control Manual for Precast Concrete Plants

2. NPCA Selected ASTM Standards for Precast Concrete

1.04 SUBMITTALS

A. The following shall be submitted to the Engineer in compliance with Section 01 32 19:

1. Design criteria, detailed calculations and detailed layout drawings of precast concrete structures, and reinforcement.

2. Shop drawings and product data for steps, anchors, inserts, joints, and hardware.
3. Concrete mix design.

4. Shop Drawings of frames, grates and covers, steel grates and covers, and all appurtenances.

PART 2 - PRODUCTS

2.01 DESIGN CRITERIA

A. Design loads shall be in accordance with ASTM 857 and as modified and supplemented herein.

1. Dead load as required, including loads due to sloping ground.

2. Live Load:

   a. AASHTO loading class HS-20-44 for all structures within traveled area and within 10 feet from the nearest traveled areas.

   b. AASHTO loading class HS-15-44 for all other structures.

   c. Impact load shall be considered as applicable.

3. Construction, handling, shipping and installation loads as required and determined by the manufacturer.

4. Unless otherwise specified, live loads for top components, such as roof, manhole cover, frame, and grating shall be the same as for the structure.

B. Design requirements for thicknesses of components, access openings, knockouts, sumps, placement of reinforcement, concrete strength, joints, and lifting devices shall be per ASTM C858 and as modified and supplemented herein.

1. The minimum thicknesses of components shall be as shown on the Drawings. Provide larger thicknesses if required by structural calculations.

2. The minimum reinforcement shall be #5 at 12 inches on center in each direction. Provide larger area of reinforcing steel per foot if required by structural calculations or shown on the Drawings.

3. The minimum compressive strength of concrete at 28 Calendar Days shall be 4,000 psi.

2.02 CONCRETE AND GROUT MATERIALS
A. Cement: ASTM C150, Type II, Low Alkali

B. Reinforcement: ASTM A615 or ASTM A706

C. Aggregate, water, admixtures and other materials shall be per ASTM C858.

D. Concrete Mix: Compressive strength (28-Calendar Day) shall be 4,000 psi minimum. Water to cement ratio shall be 0.45 or less. Slump shall be 4 inches or less. Selection of proportions for concrete shall be per ACI 211.1. Admixtures shall be as required and determined by the manufacturer.

E. Non-shrink and cementitious grouts shall be per Section 03 60 00.

2.03 FRAMES, COVERS AND GRATING

A. Design loads for manhole covers, frames, and grating shall be in accordance with this Section.

B. Manhole Frames and Covers:
   1. Manhole frames and covers shall be in accordance with Section 03 40 00.

C. Cast iron grates and frames shall conform to the requirements of ASTM A48, Class 30.

D. Steel and aluminum grates, covers and frames shall conform to the applicable requirements of Sections 05 50 00 and 05 53 00.

2.04 STEPS/RUNGS

A. Steps shall be provided in all structures. Step shall conform to the requirements of ASTM C-478.

B. Steps shall be in accordance with Section 05 51 50.

2.05 MANUFACTURE AND SHIPPING

A. Manufacture of precast structures, including formwork, reinforcement and concrete placement, curing and permissible variations shall be in accordance with ASTM C858, except as modified and supplemented herein.

B. Only minor repair or patchwork will be allowed on finished products. Precast structures requiring repair work for honeycombed areas or major defects are not acceptable. All repair work shall be performed in such a manner that the repaired structure conforms to ASTM C858 and this Section.
C. Precast structures shall not be shipped until concrete has reached at least 75% of the specified 28-Calendar Day compressive strength.

2.06 AGGREGATE BASE

Six-inch thick minimum aggregate base below concrete base shall be per Section 02 23 00.

2.07 MANUFACTURERS

A. Products shall be manufactured as shown on the Standard Drawings, or if not indicated, by one of the following (or equal):


2. Frames and Covers: Alhambra Foundry; Neenah Foundry Co.; Vulcan Foundry, Inc.

   a. Unless otherwise specified, 30-inch diameter manhole shall be Model A-1252B, 36-inch diameter manhole shall be Model A-1251B and 42-inch diameter manhole shall be Model A-1323 of Alhambra Foundry or approved equivalent.

   b. Unless otherwise indicated 36-inch manhole access cover and frame shall be provided.

3. Gratings: Mc Nichols; IKG Industries; AMICO Alabama Metal Industries Corporation; Ohio Gratings, Inc.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Excavation and Backfill: Excavation, preparation of subgrade and aggregate base, and backfill shall be performed per Section 02 20 00. Install at least 6-inch thick minimum aggregate base under the floor slab per Section 02 20 00.

B. Precast concrete structures shall be installed in strict conformance with ASTM C891, the manufacturer's written instructions, and additionally as shown on the Drawings. Install all required accessories and appurtenances, including cement mortar and sealants, as required for a complete installation.
C. Install covers, frames, gratings, steps, and other metal components and accessories as shown and as required for a complete installation.

D. Installation of damaged structures as determined by the City will not be allowed.

3.02 INSPECTION

Upon request, the Contractor shall provide the City adequate ventilation and a worker with ladder or other safe and adequate means for inspection access.

END OF SECTION
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PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and install grout complete as shown on the Drawings, as specified herein, and as required for complete installations of project components as applicable.

1.02 RELATED WORK

A. Concrete Work is included in Section 03 30 00.

B. Metal Work - General Provisions are included in Section 05 50 00.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01 32 19, shop drawings and product data showing materials of construction and details of installation for:

1. Commercially manufactured nonshrink cementitious grout. The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to required ASTM standards, and Material Safety Data Sheets.

2. Commercially manufactured nonshrink epoxy grout. The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to required ASTM standards, and Material Safety Data Sheets.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts and Monolithic Surfacing, and Polymer Concretes

2. ASTM C827 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures


B. U.S. Army Corps of Engineers Standard (USACE)

1. CRD-C 621 - Corps of Engineers Specification for Nonshrink Grout

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the Site in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers and printed instructions.

B. Store materials in full compliance with the manufacturer's recommendations. Total storage time from date of manufacture to date of installation shall be limited to 12 months or the manufacturer's recommended storage time, whichever is less.

C. Material that becomes damp or otherwise unacceptable shall be removed immediately from the Site and replaced with acceptable material at no additional expense to the City.

D. Nonshrink cement-based grouts shall be delivered as preblended, prepackaged mixes requiring only the addition of water.

E. Nonshrink epoxy grouts shall be delivered as premeasured, prepackaged, three component systems requiring only blending as directed by the manufacturer.

1.06 DEFINITIONS

Nonshrink Grout: A commercially manufactured product that does not shrink in either the plastic or hardened state, is dimensionally stable in the hardened state, and bonds to a clean base plate.

PART 2 - PRODUCTS

2.01 GENERAL

A. The use of a manufacturer's name and product or catalog number is for establishing the standard of quality required.
B. Like materials shall be the products of one manufacturer or supplier in order to provide standardization of appearance.

2.02 MATERIALS

A. Nonshrink Cementitious Grout (Nonshrink Grout)

1. Nonshrink grouts shall meet or exceed the requirements of ASTM C1107 Grades B or C and CRD-C 621. Grouts shall be portland cement based, contain a pre-proportioned blend of selected aggregates and shrinkage compensating agents, and shall require only the addition of water. Nonshrink grouts shall not contain expansive cement or metallic particles. The grouts shall exhibit no shrinkage when tested in conformity with ASTM C827.

a. General purpose nonshrink grout shall conform to the standards stated above and shall be SikaGrout 212 by Sika Corp.; Set Grout by Master Builders, Inc.; Gilco Construction Grout by Gifford Hill & Co.; Euco NS by The Euclid Chemical Co.; NBEC Grout by U. S. Grout Corp.; or approved equal.

b. Flowable (precision) nonshrink grout shall conform to the standards stated above and shall be Masterflow 928 by Master Builders, Inc.; Hi-Flow Grout by the Euclid Chemical Co.; SikaGrout 212 by Sika Corp.; Supreme Grout by Gifford Hill & Co.; Five Star Grout by U. S. Grout Corp.; or approved equal.

B. Nonshrink Epoxy Grout

1. Nonshrink epoxy-based grout shall be a pre-proportioned, three-component, 100 percent solids system consisting of epoxy resin, hardener, and blended aggregate. It shall have a compressive strength of 14,000 psi in 7 Calendar Days when tested in accordance with ASTM D695 and have a maximum thermal expansion of 30 x 10^{-6} when tested in accordance with ASTM C531. The grout shall be Ceilcote 648 CP by Master Builders, Inc.; Five Star Epoxy Grout by U.S. Grout Corp.; Sikadur 42 Grout-Pak by Sika Corp.; High Strength Epoxy Grout by the Euclid Chemical Co.; or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION

A. Grout shall be placed over cured concrete that has attained its full design strength unless otherwise approved in writing by the Engineer.
B. Concrete surfaces to receive grout shall be clean and sound, free of ice, frost, dirt, grease, oil, curing compounds, laitance and paints, and free of all loose material or foreign matter which may affect the bond or performance of the grout.

C. Roughen concrete surfaces by chipping, sandblasting, or other mechanical means to ensure bond of the grout to the concrete. Remove loose or broken concrete. Irregular voids or projecting coarse aggregate need not be removed if they are sound, free of laitance and firmly embedded into the parent concrete.

1. Air compressors used to clean surfaces in contact with grout shall be the oilless type or equipped with an oil trap in the airline to prevent oil from being blown onto the surface.

D. Remove all loose rust, oil or other deleterious substances from metal embedments or bottom of base plates prior to the installation of the grout.

E. Concrete surfaces shall be washed clean and kept moist for at least 24 hours prior to the placement of cementitious or cement grout. Saturation may be achieved by covering the concrete with saturated burlap bags, use of a soaker hose, flooding the surface, or other method acceptable to the Engineer. Upon completion of the 24-hour period, visible water shall be removed from the surface prior to grouting. The use of an adhesive bonding agent in lieu of surface saturation shall only be used when accepted in writing by the Engineer for each specific location of grout installation.

F. Epoxy-based grouts do not require the saturation of the concrete substrate. Surfaces in contact with epoxy grout shall be completely dry before grouting. Where specified on the Drawings, apply epoxy bonding agent neatly on existing surface prior to placing epoxy grout.

G. Construct grout forms or other leakproof containment as required. Forms shall be lined or coated with release agents recommended by the grout manufacturer. Forms shall be of adequate strength, securely anchored in place, and shored to resist the forces imposed by the grout and its placement.

1. Forms for epoxy grout shall be designed to allow the formation of a hydraulic head and shall have chamfer strips built into forms.

H. Level and align the structural or equipment bearing plates in accordance with the structural requirements and the recommendations of the equipment manufacturer.

I. Equipment shall be supported during alignment and installation of grout by shims, wedges, blocks or other approved means. The shims, wedges and
blocking devices shall be prevented from bonding to the grout by appropriate bond breaking coatings and removed after grouting unless otherwise accepted by the Engineer.
3.02 INSTALLATION - GENERAL

A. Mix, apply and cure products in strict compliance with the manufacturer's recommendations and this Section.

B. Have sufficient workers and equipment available for rapid and continuous mixing and placing. Keep all necessary tools and materials ready and at hand.

C. Maintain temperatures of the foundation plate, supporting concrete, and grout between 40 and 90 degrees F during grouting and for at least 24 hours thereafter or as recommended by the grout manufacturer, whichever is longer. Take precautions to minimize differential heating or cooling of baseplates and grout during the curing period.

D. Take special precautions for hot weather or cold weather grouting as recommended by the manufacturer when ambient temperatures and/or the temperature of the materials in contact with grout are outside of the 60 to 90 degrees F range.

E. Install grout in a manner that will preserve the isolation between the elements on either side of the joint where grout is placed in the vicinity of a control joint.

F. Reflect all existing underlying expansion, control and construction joints through the grout.

3.03 INSTALLATION - NONSHRINK GROUTS

A. Mix in accordance with manufacturer's recommendations. Do not add cement, sand, pea gravel or admixtures without prior written acceptance by the Engineer.

B. Mix in a mortar mixer (with moving blades). Add pre-measured amount of water for mixing, followed by the grout. Begin with the minimum amount of water recommended by the manufacturer and add the minimum additional water required to obtain workability. Do not exceed the manufacturer's maximum recommended water content.

C. Add aggregates as recommended by the manufacturer. Comply with the manufacturer's recommendations for the size and amount of aggregate to be added.

D. Place grout into the designated areas in a manner that will avoid segregation or entrapment of air. Do not vibrate grout to release air or to consolidate the material. Placement shall proceed in a manner that will ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary.
E. Place grout rapidly and continuously to avoid cold joints. Do not place cement grouts in layers. Do not add additional water to the mix (retemper) after initial stiffening.

F. Just before the grout reaches its final set, cut back the grout to the substrate at a 45-degree angle from the lower edge of the bearing plate unless otherwise approved by the Engineer. Finish this surface with a wood float finish.

G. Begin curing immediately after form removal, cutback, and finishing. Keep grout moist and within its recommended placement temperature range for at least 24 hours after placement or longer if recommended by the manufacturer. Saturate the grout surface by use of wet burlap, soaker hoses, ponding or other approved means. Provide sunshades as necessary. If drying winds inhibit the ability of a given curing method to keep grout moist, erect wind breaks until wind is no longer a problem or curing is finished.

3.04 INSTALLATION - NONSHRINK EPOXY GROUTS

A. Mix in accordance with the procedures recommended by the manufacturer. Do not vary the ratio of components or add solvent to change the consistency of the grout mix. Do not overmix. Mix full batches only to maintain proper proportions of resin, hardener and aggregate.

B. Monitor ambient weather conditions and contact the grout manufacturer for special placement procedures to be used for temperatures below 60 or above 90 degrees F.

C. Place grout into the designated areas in a manner that will avoid trapping air. Placement methods shall ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary.

D. Minimize "shoulder" length (extension of grout horizontally beyond base plate). In no case shall the shoulder length of the grout be greater than the grout thickness.

E. Finish grout by puddling to cover all aggregate and provide a smooth finish. Break bubbles and smooth the top surface of the grout in conformity with the manufacturer's recommendations.

F. Epoxy grouts are self curing and do not require the application of water. Maintain the formed grout within its recommended placement temperature range for at least 24 hours after placing or longer if recommended by the manufacturer.
G. Add aggregates as recommended by the manufacturer. Comply with the manufacturer's recommendations for the size and amount of aggregate to be added.
3.05 SCHEDULE

A. Unless otherwise specified on the Drawings or other Sections of these Specifications, the following list indicates where the particular types of grout are to be used:

1. General purpose nonshrink grout: Use at all locations where nonshrink grout is called for on the Drawings except for base plates greater in area than 3 ft. wide by 3 ft. long and except for the setting of anchor rods, anchor bolts or reinforcing steel in concrete.

2. Flowable nonshrink grout: Use under all base plates greater in area than 3 ft. by 3 ft. Use at all locations indicated to receive flowable nonshrink grout on the Drawings. The Contractor, at his/her option and convenience, may also substitute flowable nonshrink grout for general-purpose nonshrink grout.

3. Nonshrink epoxy grout: Use at locations specifically indicated to receive epoxy grout. Use nonshrink epoxy grout for setting base plates.

END OF SECTION
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PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and cut, remove, repair or otherwise modify parts of existing concrete structures or appurtenances as shown on the Drawings and as specified herein. Work under this Section shall also include bonding new concrete to existing concrete.

1.02 RELATED WORK

A. Concrete Work is included in Section 03 30 00.
B. Grout is included in Section 03 60 00.
C. Metal Work - General Provisions are included in Section 05 50 00.
D. Sealants and Caulking are included in Section 07 92 00.

1.03 SUBMITTALS

Submit manufacturer's technical literature on all product brands proposed for use, to the Engineer for review. The submittal shall include the manufacturer's installation and/or application instructions.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
2. ASTM C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Sheer
6. ASTM D732 - Standard Test Method for Shear Strength of Plastics by Punch Tool

B. American Concrete Institute (ACI).
   
   1. ACI 503 - Use of Epoxy Compounds with Concrete
   
   2. ACI 546R - Guide to Concrete Repair

1.05 QUALITY ASSURANCE

A. No existing structure or concrete shall be shifted, cut, removed, or otherwise altered unless shown on the Drawings or until authorization is given by the City.

B. When removing materials or portions of existing structures and when making openings in existing structures erect all necessary barriers, shoring and bracing and other protective devices to prevent damage to the structures beyond the limits necessary for the new work, protect personnel, control dust and exercise care to prevent damage to the structures or contents by falling or flying debris.

C. Unless otherwise permitted or specified, saw cutting will be required in cutting existing concrete. Line drilling and chipping of concrete will be acceptable.

D. Manufacturer Qualifications: The manufacturer of the specified products shall have a minimum of 5 years experience in the manufacture of such products and shall have an ongoing program of training, certifying and technically supporting the Contractor's personnel.

E. Personnel having a minimum of three years of experience in repairing and modifying existing concrete structures using materials specified herein shall be used in or for performing the Work specified in this Section.

F. Protect all existing structures in place. Install all necessary temporary supports to protect existing structures.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver the specified products in original, unopened containers with the manufacturer's name, labels, product identification and batch numbers.

B. Store and condition the specified product as recommended by the manufacturer.
PART 2 - PRODUCTS

2.01 MATERIALS

A. General

1. Materials shall comply with this Section and any state or local regulations.

B. Structural Adhesive Epoxy System for Anchors:

1. Structural adhesive epoxy system shall be two-component 100% solids epoxy based system meeting the requirements of ASTM C881.

2. Properties of the cured material shall meet or exceed the following:
   a. Compressive Strength (ASTM D695): 12,000 psi minimum at 28 Calendar Days
   b. Tensile Strength (ASTM D638): 4,000 psi minimum at 14 Calendar Days

3. Structural adhesive epoxy system for threaded rod anchors and deformed rebar dowels shall be Simpson SET, Covert CIA-Gel 7000, HILTI HIT RE 500, Sikadur AnchorFix-4, Epcon C6 or approved equivalent.

4. Structural adhesive epoxy system shall be used to attach threaded rod anchors and deformed rebar dowels to existing concrete, where shown on the Drawings and as specified herein.

C. Structural Repair Mortar:

1. Structural repair mortar shall be two-component polymer-modified, Portland cement, fast setting, non-sag mortar with corrosion inhibitor.

2. Properties of the cured material shall meet or exceed the following:
   a. Compressive Strength (ASTM C109): 6,500 psi minimum at 28 Calendar Days
   b. Flexural Strength (ASTM C293): 2,000 psi minimum at 28 Calendar Days
   c. Bond Strength (ASTM C882): 2,000 psi minimum at 28 Calendar Days

3. Structural repair mortar shall be SikaTop 123 Plus as manufactured by Sika or approved equivalent.
4. Structural repair mortar shall be used to patch damaged concrete, protecting exposed reinforcement and repairing drilled holes, where shown on the Drawings and as specified herein.

D. Epoxy/Epoxy Bonding Agent

1. Epoxy bonding agent shall be a two-component, solvent-free, asbestos-free moisture insensitive epoxy resin material complying with the requirements of ASTM C881, and the additional requirements specified herein.

2. Properties of the cured material shall meet or exceed the following:
   a. Compressive Strength (ASTM D695): 10,000 psi minimum at 28 Calendar Days
   b. Tensile Strength (ASTM D638): 7,000 psi minimum at 14 Calendar Days
   c. Flexural Strength (ASTM D790): 6,000 psi minimum at 14 Calendar Days
   d. Shear Strength (ASTM D732): 5,000 psi minimum at 14 Calendar Days
   e. Bond Strength (ASTM C882) Hardened to Plastic: 1,500 psi minimum at 14 Calendar Days moist cure

3. Epoxy bonding agent shall be Sikadur 32 Hi-Mod or Sikadur 32 Hi-Mod LPL as manufactured by Sika, Concresive Liquid (LPL) by Master Builders/ChemRex, Inc. or approved equal.

4. Epoxy bonding agent shall be used to bond fresh concrete to hardened concrete, bond fresh epoxy grout to hardened concrete, grouting base plates, where shown on the Drawings and as specified herein.

E. Epoxy Paste

1. Epoxy Paste shall be a two-component, solvent-free, asbestos-free, moisture insensitive epoxy resin material meeting the requirements of ASTM C881, and the additional requirements specified herein.

2. Properties of the cured material shall meet or exceed the following:
   a. Compressive Strength (ASTM D695): 10,000 psi minimum at 28 Calendar Days
   b. Tensile Strength (ASTM D638): 3,000 psi minimum at 14 Calendar Days
c. Flexural Strength (ASTM D790): 4,000 psi minimum at 14 Calendar Days

d. Shear Strength (ASTM D732): 3,000 psi minimum at 14 Calendar Days

e. Bond Strength (ASTM C882) Hardened to hardened: 2,000 psi minimum at 14 Calendar Days moist cure

3. Epoxy paste shall be Sikadur Hi-mod 31 Gel by Sika, Concrexive 1420 by Master Builders/ChemRex, Inc. or approved equal.

4. Epoxy paste shall be used to bond hardened concrete to hardened concrete, bond steel plates to hardened concrete, setting railing posts, dowels, anchor bolts and all-threads into hardened concrete, where shown on the Drawings and as specified herein. It may also be used to patch existing surfaces where the glue line is 1/8-inch or less.

F. Epoxy Mortar

1. Epoxy mortar shall be made using structural adhesive epoxy and oven dried aggregates as per the recommendations of the epoxy manufacturer. The epoxy-bonding agent shall be a two-component, solvent-free, asbestos-free moisture insensitive epoxy resin material complying with the requirements of ASTM C881, and the additional requirements specified herein.

2. Properties of the cured epoxy material shall meet or exceed the following:

   a. Compressive Strength (ASTM D695): 10,000 psi minimum at 28 Calendar Days

   b. Tensile Strength (ASTM D638): 7,000 psi minimum at 14 Calendar Days

   c. Flexural Strength (ASTM D790): 6,000 psi minimum at 14 Calendar Days

   d. Shear Strength (ASTM D732): 5,000 psi minimum at 14 Calendar Days

   e. Bond Strength (ASTM C882): 2,000 psi minimum at 14 Calendar Days moist cure

3. Epoxy bonding agent shall be Sikadur 32 Hi-Mod, Sikadur 32 Hi-Mod LPL, or Sikadur 35, Hi-Mod LV as manufactured by Sika, Concrexive Liquid (LPL) by Master Builders/ChemRex, Inc. or approved equal.

4. Epoxy mortar shall be used to repair and patch concrete surfaces, grout steel plates, where shown on the Drawings and as specified herein.
G. Non-Shrink Cement Grout and Non-Shrink Epoxy Grout are included in Section 03600.

H. Crack Repair Epoxy Adhesive

1. Crack Repair Epoxy Adhesive shall be a two-component, solvent-free, moisture insensitive epoxy resin material suitable for crack grouting by injection or gravity feed. It shall be formulated for the specific size of opening or crack being injected.
2. Properties of the cured material shall meet or exceed the following:
   a. Compressive Strength (ASTM D695): 10,000 psi minimum at 28 Calendar Days
   b. Tensile Strength (ASTM D638): 7,000 psi minimum at 14 Calendar Days
   c. Flexural Strength (ASTM D790): 12,000 psi minimum at 14 Calendar Days
   d. Shear Strength (ASTM D732): 5,000 psi minimum at 14 Calendar Days
   e. Bond Strength (ASTM C882): 2,000 psi minimum at 14 Calendar Days moist cure

3. Approved products include:
   a. For standard applications: Sikadur 35 Hi-Mod LV by Sika Corporation, Concresive 1380 by Master Builders Inc., or approved equal.
   b. For very thin applications: Sikadur Hi-Mod LV by Sika, Concresive 1468 by Master Builders, Inc., or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Cut, repair, reuse, demolish, excavate or otherwise modify parts of the existing structures or appurtenances, as indicated on the Drawings, specified herein, or necessary to permit completion of the Work. Finishes, joints, reinforcements, sealants, etc., are specified in respective sections. All work shall comply with other requirements of this Section and as shown on the Drawings.

B. All commercial products specified in this Section shall be stored, mixed and applied in strict compliance with the manufacturer's recommendations.

C. In all cases where concrete is repaired in the vicinity of an expansion joint or control joint, the repairs shall be made to preserve the isolation between components on either side of the joint.

D. All existing facilities not to be modified shall be protected in place.

3.02 REMOVAL AND PROTECTION OF EXISTING CONCRETE

A. Unless otherwise specified, existing concrete components to remain shall be protected in place.
B. Concrete designated to be removed to specific limits as shown on the Drawings or directed by the Engineer, shall be done by saw cutting. Line drilling at limits followed by careful chipping in areas where concrete is to be taken out may be performed as approved in writing by the Engineer.

C. All removed concrete shall be disposed off the Site.

D. Remove concrete in such a manner that existing surrounding concrete, reinforcing or equipment to be left in place is not damaged.

E. In all cases where the joint between new concrete or grout and existing concrete will be exposed in the finished work, except as otherwise shown or specified, the edge of concrete removal shall be a 1-inch deep saw cut on each exposed surface of the existing concrete.

F. Damaged concrete that is to be protected in place shall be repaired by approved means to the satisfaction of the Engineer. This may include, but not limited to the following:

1. Removal and replacement of the damaged concrete as determined by the City.

2. Removal of damaged concrete, chipping additional concrete, sand blasting existing concrete surface, patching with non-shrink repair grout or epoxy mortar as required and determined by the City.

3. If existing reinforcement are damaged, they shall be repaired as specified in Paragraph 3.03.

3.03 REMOVAL AND PROTECTION OF EXISTING REINFORCEMENT

A. Unless otherwise specified, existing reinforcement for concrete components to remain shall be protected in place.

B. Reinforcement designated to be removed to specific limits as shown on the Drawings or directed by the Engineer, shall be done by saw cutting. Unless otherwise specified reinforcement inside the existing concrete component to be removed shall be removed.

C. All removed reinforcement shall be disposed off the Site.

D. Where shown on the Drawings, existing reinforcement to be reused shall be protected in place. Contractor shall be careful not to damage the existing reinforcement while removing the surrounding concrete. Manual chipping of surrounding concrete may be required. Clean all existing reinforcement to be reused with wire brush to remove debris, loose concrete and dust prior to placement of new concrete.
E. Where drilling is to be performed to install new anchors or dowels inside existing concrete members or concrete placed under this Contract, existing reinforcement shall be located using non-destructive rebar locator prior to drilling. Existing reinforcement shall not be cut during drilling for installation of new anchors or dowels.

1. If existing reinforcement is encountered, drilling shall be stopped immediately and the drilled hole shall be repaired using epoxy mortar. Epoxy mortar shall be as specified herein. A new hole shall be drilled avoiding existing reinforcement.

2. If existing reinforcement is cut, the Contractor shall notify the City immediately. The Contractor shall perform repair work as required and as determined by the City. This may include, but not limited to the following:
   a. Filling drilled hole with high strength epoxy mortar if reinforcement is not critical as determined by the Engineer.
   b. Chipping concrete around the cut reinforcement, drilling and installing new dowels to offset the cut bar, and repairing concrete by placing new non-shrink concrete and/or repair mortar as required.
   c. Chipping concrete around the cut reinforcement, welding a new bar to the existing cut bar, and repairing concrete by placing new non-shrink concrete and/or repair mortar as required.
   d. Chipping concrete around the cut reinforcement, installing a mechanical coupler to join the existing cut bar, and repairing concrete by placing new non-shrink concrete and/or repair mortar as required.

F. Existing reinforcement shall not be welded to new reinforcement unless approved by the Engineer.

G. Where existing reinforcement are exposed due to saw cutting, core drilling or chipping and no new concrete material is to be placed against them, 1/2" thick epoxy mortar or 1/4" thick epoxy paste shall be applied to the entire concrete cut surface.

3.04 CONNECTION SURFACE PREPARATION

A. Connection surfaces of all concrete areas requiring patching, repairs, or modifications, or receiving new concrete as shown on the Drawings, specified herein, or as directed by the City shall be prepared as specified below.

B. Remove all deteriorated and loose concrete materials, dirt, oil, grease, asphalt emulsion, paint, and all other bond-inhibiting materials from the surface by dry
mechanical means such as chipping, sandblasting, grinding and/or bush hammering.

C. Roughen concrete surfaces by sandblasting, bush hammering or other suitable mechanical means to ensure the adherence. At a minimum, provide ¼” amplitude in the existing concrete surface. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded into parent concrete, subject to the City’s final inspection.

D. If reinforcing steel is exposed, exposed surfaces shall be mechanically cleaned to remove all contaminants, rust, etc. If half or more of the diameter of the reinforcing steel is exposed, chip out concrete all around the reinforcing steel. The distance chipped around the reinforcing steel shall be a minimum of 1/2-inch. Reinforcing to be saved shall not be damaged during the demolition operation.

E. Reinforcing from existing demolished concrete that is shown to be incorporated in new concrete shall be cleaned by mechanical means to remove all loose material and products of corrosion before proceeding with the repair. It shall be cut, bent or lapped to new reinforcing as shown on the Drawings and provided with 1-inch minimum cover all around.

F. Install dowels, shear pins and/or anchor bolts as shown on the Drawings and in accordance with Paragraph 3.05.

G. Unless otherwise specified, epoxy-bonding agent shall be applied on existing surface of structural concrete, including reservoir roof slab, floor slab and wall prior to placing new concrete on or abutting existing concrete. Epoxy bonding agent shall be applied as per manufacturer’s recommendations.

H. Where new concrete or cementitious mixture is to be placed on or abutting existing non-structural concrete, thoroughly moisten the existing surface with water. Brush on a 1/16-inch layer of cement and water mixed to the consistency of a heavy paste. Immediately after application of cement paste, place new concrete or cementitious mixture as shown on the Drawings, specified herein or as directed by the City.

I. Where new epoxy or epoxy-based mortar is to be placed moistening of existing concrete surface is not required. If existing concrete surface is wet, it shall be allowed to dry prior to placement of epoxy material. Place epoxy or epoxy based mortar as shown on the Drawings, specified herein or as directed by the City. After placement of epoxy or epoxy mortar, install new concrete or cementitious mixture as shown on the Drawings, specified herein or as directed by the City.

3.05 INSTALLING DRILLED REINFORCING DOWELS, SHEAR PINS OR ANCHOR BOLTS

A. Locate existing reinforcement using non-destructive rebar locator. Drilling for
installing dowels, shear pins or bolts shall be performed such as to avoid
interference with the existing rebars. Contractor shall protect the existing rebars as per this Section, including Paragraph 3.03.

B. Hole Preparation and Setting Embedded Item:

1. The hole diameter shall be as recommended by the epoxy manufacturer. The hole diameter shall be approximately 0.25 inch greater than the diameter of the outer surface of the reinforcing bar deformations or bolts.

2. The depth of the hole shall be as recommended by the epoxy manufacturer to fully develop the bar but shall not be less than 12 bar diameters, unless noted otherwise.

3. The hole shall be drilled by methods that do not interfere with the proper bonding of epoxy.

4. Existing reinforcing steel in the vicinity of proposed holes shall be located prior to drilling. The location of holes to be drilled shall be adjusted to avoid drilling through or nicking any existing reinforcing bars.

5. The hole shall be blown clean with clean, dry compressed air to remove all dust and loose particles.

6. Epoxy shall be injected into the hole through a tube placed to the bottom of the hole. The tube shall be withdrawn as epoxy is placed but kept immersed to prevent formation of air pockets. The hole shall be filled to a depth recommended by the manufacturer of epoxy and that ensures that excess material will be expelled from the hole during dowel placement.

7. The material (dowel) to be embedded shall be twisted during insertion into the partially filled hole to guarantee full wetting of the bar surface with epoxy. The bar shall be inserted slowly enough to avoid developing air pockets.

3.06 GROUTING

Grouting shall be as specified in Section 03 60 00.

3.07 INSTALLATION OF EPOXY AND EPOXY BASED MATERIALS

A. Preparation of surfaces shall be as specified herein and as recommended by the manufacturer.

B. Proportioning and mixing of epoxy and epoxy mortar shall be in accordance with the manufacturer’s recommendations. Mixing of epoxy material shall produce a uniform and homogeneous mix. The mixing of epoxy mortar shall
be such that the epoxy binder shall thoroughly wet each aggregate particle. Unless otherwise specified, mechanical mixing shall be required.

C. Application of epoxy and epoxy mortar shall be in accordance with the manufacturer’s recommendations.

3.08 CRACK REPAIR

A. Crack repair using pressure-injected epoxy shall be performed in accordance with the recommendations by the epoxy manufacturer, as specified herein and as recommended in ACI 503.

B. Remove loose concrete and clean existing concrete surfaces near cracks by sandblasting or water blasting. Cracks shall be vacuumed to remove dust, debris and water.

C. After cleaning and preparation of surfaces, cracks at surface shall be sealed with a non-sagging epoxy paste, such as, Sikadur 31 Hi-mod Gel by Sika. If required, a V-notch, 3/4-inch wide by 1/2-inch deep, shall be formed along the crack prior to sealing it with epoxy paste.

D. Install epoxy entry/injection ports along the cracks. Exterior edges of entry ports shall be sealed using a non-sagging epoxy paste, such as, Sikadur 31 Hi-mod Gel by Sika. Number and locations of the ports shall be such to ensure complete filling of the cracks with epoxy.

E. In horizontal members, injection of epoxy shall proceed from one end of the crack to the other through adjacent ports. In vertical members, injection of epoxy shall start at the lowest port. Injection shall continue at each port until epoxy starts flowing out of the adjacent port in a steady stream. Pressure used for injection shall be carefully selected to ensure proper filling of cracks and to avoid any damage to existing members.

F. The Contractor shall drill cores from the completed work for the City to visually inspect the crack repair work. Locations of the cores will be determined in field by the City. The Contractor shall drill up to one core, 2” in diameter, for every 50 feet of crack repair. Core holes shall be repaired using epoxy mortar. If crack repair work is found to be unacceptable, the Contractor shall provide a remedial plan for Engineer’s approval. The Contractor shall perform approved remedial work at no additional cost to the City.

END OF SECTION
SECTION 04 22 00
REINFORCED CONCRETE BLOCK MASONRY

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and install complete and in place concrete masonry structures, including reinforcing steel, embedded items, and all other appurtenant work.

1.02 RELATED WORK

A. Concrete Work is included in Section 03 30 00.

B. Waterproofing is included in Section 07 90 00.

1.03 STANDARD SPECIFICATIONS

Except as otherwise indicated in this Section of the Specifications, the Contractor shall comply with the Standard Specifications for Public Works Construction (SSPWC).

1.04 CODES

A. The work of this Section shall comply with the current editions of the following codes.

1. California Building Code

1.05 REFERENCE STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the work of this Section:

1. Commercial Standards

a. ACI 315R - Guide to Presenting Reinforcing Steel Design Details

b. ACI 530 - Building Code Requirements and Specification for Masonry Structures

c. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
d. ASTM C5 - Standard Specification for Quicklime for Structural Purposes

e. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units

f. ASTM C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units

g. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar

h. ASTM C150 - Standard Specification for Portland Cement

i. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes

j. ASTM C270 - Standard Specification for Mortar for Unit Masonry

k. ASTM C404 - Standard Specification for Aggregates for Masonry Grout

l. ASTM C426 - Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units

m. ASTM C476 - Standard Specification for Grout for Masonry

n. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation

o. ASTM E447 - Test Method for Compressive Strength of Masonry Prisms


q. Portland Cement Association, Concrete Masonry Handbook

1.06 SUBMITTALS

A. The following shall be submitted in compliance with Section 01 32 19:

1. Sources of cement, pozzolan, and aggregates.

2. Material Safety Data Sheets (MSDS) for admixtures.


5. Mortar and grout mix design, including quantity of each constituent per cubic yard, water-cementitious materials ratio, type and manufacturer of cement.

6. Manufacturer's data for concrete masonry units.

7. Drawings shall be submitted for fabrication, bending, and placement of reinforcement bars. Comply with ACI 315R “Guide to Presenting Reinforcing Steel Design Details.” Bar schedules, diagrams of bend bars, stirrup spacing, lateral ties and other arrangements and assemblies shall be shown as required for fabrication and placement.

8. Charts showing all available colors and textures for masonry units. The City will select up to three colors for each type of unit/texture for preliminary selections.

B. Samples

1. Two samples of concrete masonry units and caps selected as preliminary selections in accordance with 1.06.A.8 for each type of structure. The final color in specified texture will be selected by the City.

2. Two full size samples of the blocks and caps with final color and textures selected by the City for each type of structure.

3. Samples of mortar colors shall be submitted for color selection by the City.

C. Test Reports

1. Fine aggregates – sieve analysis, physical properties, and deleterious substances.

2. Coarse aggregates – sieve analysis, physical properties, and deleterious substances.

3. Cements – chemical analysis and physical properties for each type.


5. Factory test reports for masonry units.
D. Certifications

1. Submit certification from qualified laboratory for each type of aggregates in accordance with ASTM C1077, confirming that the aggregates are innocuous/non-reactive.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Cement, lime, and other cementitious materials shall be delivered to the site and stored in dry, weather-tight sheds or enclosures, in unbroken bags, barrels, or other containers, plainly marked and labeled with the manufacturers' names and brands.

B. Mortar and grout shall be stored and handled in a manner that will prevent the inclusion of foreign materials and damage by water or dampness.

C. Masonry units shall be handled with care to avoid chipping and breakage and shall be stored as directed in the Concrete Masonry Handbook.

D. Materials stored on newly constructed floors shall be stacked in such manner that the uniformly distributed loading does not exceed 30 psf.

E. Masonry materials shall be protected from contact with the earth and exposure to the weather and shall be kept dry and clean until used.

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete masonry units shall conform to SSPWC subsection 202-2, with maximum linear shrinkage of 0.06 percent from standard to oven-dried condition.

B. Concrete masonry units shall be of normal weight and conforming to ASTM C90.

C. All masonry units shall have a minimum compressive strength of 1,900 psi.

D. The color shall be as selected by the City.

E. Block and cap sizes shall be as shown on the Drawings and as required.

F. Unless otherwise specified, all masonry units shall be standard split face. Interior faces of all block shall be smooth.
G. Cap shall be precision type.

H. All bond beam, corner, lintel, sill, and other specially shaped blocks shall be provided and used where required or necessary. Specially shaped non-structural blocks may be constructed by saw cutting. Color and texture shall match that of adjacent units.

2.02 MATERIALS FOR MORTAR AND GROUT

A. Materials for mortar and grout shall conform to SSPWC subsection 202-2.2 and the following requirements.

B. Mortar shall be composed of one part Portland cement and not less than two and one-half parts nor more than three parts of sand, based on dry loose volumes and not less than one-fourth part and not more than one-half part lime putty or hydrated lime. Mortar shall be colored as approved by the City. Mortar shall have a minimum 28-day compressive strength of 2,500 psi. Mortar shall conform to ASTM C270 Type M.

C. Grout shall consist of one part portland cement to not more than three parts sand and not less than one part nor more than one part pea gravel based on dry loose volume. The combined mix shall be proportioned to make a workable mix. Sufficient water shall be added to cause it to flow into all joints of the masonry. Grout shall develop a minimum compressive strength of 3,000 psi in 28 Calendar Days.

D. Portland cement shall be Type II, low alkali, conforming to ASTM C150.

E. Lime paste shall be made with pulverized quicklime or with hydrated lime, which shall be allowed to soak not less than 72 hours before use, except that hydrated lime processed by the steam method shall be allowed to soak not less than 24 hours and shall be made by adding the lime to the water. In lieu of hydrated lime paste for use in mortar, the hydrated lime may be added in the dry form. Hydrated lime shall be Type S, conforming to ASTM C207. Pulverized quicklime shall conform to ANSI/ASTM C5, shall pass a No. 20 sieve, and 90 percent shall pass a No. 50 sieve.

F. Sand shall conform to ASTM C144.

G. Coarse aggregate shall conform to ASTM C404.

H. Water for mixing shall be clear potable water.

I. Reinforcing steel shall be deformed bars conforming to ASTM A615, Grade 60 for bars No. 3 to No. 18, except as otherwise indicated.
J. Admixture for mortar and grout shall not be detrimental to the bonding or help the process of efflorescence and shall be submitted and accepted by the Engineer prior to use.

2.03 MASONRY DESIGN STRENGTH

Masonry compressive strength for purpose of design shall be 1,500 psi maximum.

2.04 JOINT MATERIALS AND OTHER ACCESSORIES

A. Rubber compound for joint shall conform to ASTM D2287.

B. PVC compound for joint shall conform to ASTM D2000.

C. Provide foam backer rod and sealant in accordance with Section 07 92 00.

2.05 DRAINAGE MATERAIL

A. Drainage material for retaining wall shall be Mirafi G100N. Provide required aluminum plates, accessories, appurtenances, hardware, etc. as required to complete installation as shown on Drawings and as recommended by manufacturer.

B. 1 ½” PVC sch 40 pipe for retaining wall drains.

PART 3 - EXECUTION

3.01 GENERAL

A. Concrete block masonry construction shall comply with SSPWC subsection 303-4.1 and to the requirements supplemented and modified herein.

B. The Contactor shall coordinate with manufactures of all items to be installed inside masonry work for required rough openings. This shall include, but not limited to, doors, fans, windows, glass blocks, and like items. The Contractor shall be responsible for providing required openings. Sizes of openings shown on the Drawings and in other Sections of these Specifications are approximate.

C. Concrete masonry units shall not be placed when air temperature is below 40 degrees F (4 degrees C) and shall be protected against direct exposure to the wind and sun when erected when the ambient air temperature exceeds 99 degrees F (37 degrees C) in the shade, with relative humidity less than 50 percent.
D. Concrete masonry shall conform to the California Building Code, the Masonry Design Manual published by the Masonry Industry Advancement Committee, and other applicable codes and standards of governing authorities.

E. Tolerances for concrete masonry units shall conform to the following:

1. Maximum variation from plumb:
   a. In walls and corners: 1/4 inch in 10 feet; 3/8 inch in 20 feet maximum; 1/2 inch in 40 feet.
   b. For external corners and other conspicuous lines: 1/4 inch in 20 feet maximum; 1/2 inch in 40 feet.

2. Maximum variation from level or indicated elevations: 1/4 inch in any bay or 20 feet; 1/2 inch in 40 feet.

3. Maximum variation from plan position indicated on the Drawings: 1/2 inch maximum.

F. Measurements for mortar and grout shall be accurately made. Shovel measurements are not acceptable. Mortar proportions shall be accurately controlled and maintained.

G. All masonry units shall be fully grouted.

H. All work shall be performed in accordance with the provisions of the applicable code for reinforced concrete hollow-unit masonry.

I. The Contractor shall set or embed in his work all anchors, bolts, reglets, sleeves, conduits, and other items as required.

J. All block cutting shall be by machine.

K. Masonry units shall be supported off the ground and shall be covered to protect them from rain. Only clean, dry, uncracked units shall be incorporated into the Work. Concrete masonry units shall not be wetted.

L. All reinforcing steel shall be cleaned of all loose rust and scale, and all oil, dirt, paint, laitance, or other substances that may be detrimental to or reduce bonding of the steel and concrete.

M. Immediately before starting work, the concrete upon which the masonry will be laid shall be cleaned with water under pressure.

N. A full mortar joint for first course shall be provided.
O. Units shall be shoved tightly against adjacent units to assure a good mortar bond.

3.02 SHORING AND BRACING

A. All shoring and bracing shall be provided as required for the work. Shoring and bracing shall be constructed to required shapes and sizes, capable of supporting and sustaining the loads to which they will be subjected without failure or deflection. Shores and bracing shall be left in place until concrete masonry can safely carry all required live and dead loads.

B. Concrete masonry walls shall be adequately braced to withstand all forces to which they will be subjected during construction. Walls are not designed to be self-supporting for lateral loads until attached to floor and roof elements.

3.03 EQUIPMENT

All equipment for mixing and transporting mortar and grout shall be clean and free from set mortar, dirt, or other foreign matter.

3.04 MIXING

Mortar shall be mixed by placing 1/2 of the water and sand in the operating mixer, after which the cement, lime, and remainder of the sand and water shall be added. After all ingredients are in the mixer, they shall be mechanically mixed for not less than 5 minutes. Retempering shall be done on the mortarboard by adding water within a basin formed within the mortar, and the mortar reworked into the water. Mortar that is not used within one hour shall be discarded.

3.05 ERECTION OF CONCRETE BLOCK MASONRY

A. Masonry work shall be erected in-plane, plumb, level, straight, and true to dimensions shown and executed in accordance with acceptable practices of the trade.

B. Concrete masonry units shall be laid with full-face shell mortar beds. Vertical head joints shall be solidly filled with mortar from face of unit to a distance behind the face equal to not less than the thickness of longitudinal face shells. Crosswebs of starting course courses shall be solidly bedded in mortar.

C. Unless noted or shown otherwise, masonry shall be laid up in straight uniform courses with running bonds.

D. All masonry shall be erected to preserve the unobstructed vertical continuity of
the cells measuring not less than 3 inches by 3 inches in cross-section. Walls and cross webs shall be fully bedded in mortar.

E. Where horizontal reinforced beams are shown, special units shall be used or regular units shall be modified to allow for placement of continuous horizontal reinforcement bars. Small mesh expanded metal lath or wire screening shall be used in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or units shall be provided with solid bottoms.

3.06 JOINTS

Vertical and horizontal joints shall be uniform and approximately 3/8 inch wide. Exterior joints and interior exposed block joints shall be concave-tooled to a dense surface. Special care shall be used in tooling joints to match existing construction. Interior or exterior non-exposed masonry and masonry behind plaster shall have flush joints.

3.07 CLEANOUTS

Cleanout openings shall be provided at the bottoms of all cells to be filled at each lift or pour of grout, where such lift or pour is over 4 feet in height. Any overhanging mortar or other obstructions or debris shall be removed from the insides of such cell walls. The cleanouts shall be sealed before grouting and after inspection. Cleanout openings shall match the finished wall in exposed masonry.

3.08 REINFORCEMENT

A. General: Reinforcement bars shall not be used with kinks or bends not shown on the drawings or final shop drawings, nor shall bars be used with reduced cross-section due to excessive rusting or other causes.

B. Reinforcement shall be positioned accurately at the spacing indicated. Vertical bars shall be supported and secured against displacement. Horizontal reinforcement shall be placed as the masonry work progresses. Where vertical bars are indicated in close proximity, a clear distance shall be provided between bars of not less than the normal bar diameter or 1 inch, whichever is greater.

C. Reinforcement bars shall be spliced where shown and bars shall not be spliced at other points unless acceptable to the City. In splicing vertical bars or attaching to dowels, ends shall be lapped, placed in contact and wire tied. Not less than the minimum lap indicated shall be provided, or if not indicated, as required by governing code.

D. Prefabricated horizontal joint reinforcement shall be embedded as the work
progresses, with a minimum cover of 5/8 inch on exterior face of walls and 1/2 inch at other locations. Units shall be lapped not less than 6 inches at ends. Prefabricated "L" and "T" units shall be used to provide continuity at corners and intersections. Units shall be cut and bent as recommended by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

E. Anchoring: Reinforced masonry work shall be anchored to supporting structures as indicated. Where required, reinforced masonry walls shall be anchored to non-reinforced masonry walls where they intersect.

F. Deep cut bond beam blocks shall be used where horizontal reinforcing steel is embedded. H-block bond beams may be used at locations other than openings.

G. Knockout openings shall have no steel or joint reinforcing running through the opening. Head, jambs, and sill blocks shall be used to provide an even finish surface to install the window unit when blocks are removed. Joints at head, jambs, and sills shall be stacked and continuous.

H. Vertical reinforcement shall be held in position at top and bottom and at intervals not exceeding 192 diameters of the reinforcement.

3.09 GROUTING

A. All cells and bond beam spaces shall be filled solidly with grout unless indicated otherwise. Grouting shall not be started until the wall has cured for 24 hours. Grout shall not be poured in more than 8-foot lifts.

B. All grout shall be consolidated at time of pouring by puddling or vibrating. Where the grouting operation has been stopped for one hour or longer, horizontal construction joints shall be formed by stopping the grout pour 1 1/2 inches below the top of the uppermost unit.

3.10 FIELD TESTING

A. At his discretion, the City may have the mortar, grout, and masonry prisms tested.

1. The Contractor shall provide required material and prepare samples for testing.

2. The Contractor shall store the test samples in a moist environment until tested, unless directed otherwise by the City.
B. If results of field tests are unacceptable, the Contractor shall perform necessary investigative and remedial measures. These may include, but are not limited to, obtaining cored samples from affected walls and testing for strength and removal and replacement of all defective work as determined by the City.

C. Costs of tests subsequent to any failure of the mortar, grout, or prism compressive strength tests, as well as cost to repair or remediate the work in accordance with these Specifications, shall be borne by the Contractor.

3.11 PROTECTION

A. Wall surfaces and surrounding facilities shall be protected from droppings of mortar or grout during construction.

3.12 DRAIN MATERIAL

A. Mirafi drain material shall be installed in accordance with written instruction from the manufacturer and per Drawings.

B. Drain pipe through wall shall be sloped to drain and terminated approximately 2” above the finished grade.

3.13 FINISHING AND CLEANING

A. Masonry shall not be wet-finished unless exposed to extreme hot weather or hot wind and then only by using a nozzle-regulated fog spray sufficient only to dampen the face but not of such quantity to cause water to flow down over the masonry.

B. Finish masonry shall be cleaned and pointed in a manner satisfactory to the City based upon the standards established by the approved sample panel.

C. All exposed to view interior and exterior colored masonry work shall be cleaned by to remove all stains and other imperfections.

D. All exposed masonry surfaces of openings and window and door openings such as sills, heads, and jambs shall be finish block surfaces, not formed surfaces, unless indicated otherwise. Closed bottom bond beam blocks shall be used at heads and sills. Pour holes may be used at the sill under window frame and where approved by the City.

E. Provide moistureproofing coating per Section 07 90 00.

F. Provide protective coating on exterior and interior surfaces of all new masonry in accordance with Section 09 92 00.
END OF SECTION
SECTION 04 27 00
GLASS UNIT MASONRY

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and install glass unit masonry where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

1.02 RELATED WORK

Reinforced Concrete Block Masonry is included in Section 04 22 00.

1.03 SUBMITTALS

A. Submit the following to the Engineer in accordance with Section 01 32 19:

1. Materials list of items proposed to be provided under this Section.

2. Manufacturer’s product data, specifications, literature, instructions for installation and preparation, and storage and handling requirements for all materials to be provided under this Section, including glass unit masonry, sealant, and mortar.

3. STC rating of glass unit masonry.

4. Shop drawings to indicate anchorage and reinforcement for glass unit masonry as required by Section 2110 of the CBC.

B. Samples: If requested by the Engineer, submit the following:

1. One glass block unit of each type specified showing size, design, and pattern of faces.

2. Representative samples of panel reinforcing, panel anchors, expansion strips, and sealant.

C. Fire Test Reports: Submit documents verifying glass block units are classified for the specified fire exposure according to ASTM E163, CAN 4-S106, or UL 9. Label cartons of tested units with appropriate UL label.
1.04 REFERENCE STANDARDS

A. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
B. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
C. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar
E. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes
F. ASTM C270 - Standard Specification for Mortar for Unit Masonry
G. ASTM D1187 - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal
H. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing
I. CAN 4-S106 - Fire Test of Window and Glass Block Assemblies
J. UL 9 - Standard for Fire Tests of Window Assemblies

1.05 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
B. Do not install glass block units when temperature is 40 degrees Fahrenheit (4 degrees Celsius) and falling.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturers’ unopened packaging in clean, cool, dry area until ready for installation.
B. Protect opened cartons of glass block against wind-blown rain or water run-off with tarpaulins or plastic covering.
PART 2 - PRODUCTS

2.01 GLASS MASONRY UNITS

A. Provide glass masonry units Series 1919/16 90F Sahara 1S as supplied by Seves Glass Block or approved equal. The glass block unit shall have the following features:

1. Nominal Size of Block: 8"x8"x6"

2. Sound Transmission Class: 50 dB loss minimum

3. Visible Light Transmission: 38 percent minimum


B. Window dimensions and configurations shall be as shown on the Drawings.

2.02 ACCESSORIES

A. General: Provide all required accessories, appurtenances as required for complete installation of glass block windows. These shall include, but not limited to, expansion strips, reinforcement, emulsions, anchors, mortar, waterproofing, and sealant.

B. Panel Reinforcing: Two parallel 9-gauge wires either 1 5/8 inches or 2 inches on center with electrically butt-welded crosswires spaced at regular intervals, galvanized after welding, and complying with ASTM A153 and ASTM A1064.


E. Asphalt Emulsion: Water-based, complying with ASTM D1187 or D1227 as applicable to substrate. Apply at sill level only.

F. Sealant (caulk): Non-staining, waterproof mastic, silicone type, as approved by the City.

G. Mortar: Type S in accordance with ASTM C270; 1 part portland cement, 1/2 part lime, and sand to equal 2 1/4 to 3 times the amount of cementitious material, all measures by volume; add integral-type waterproofer for exterior glass block panels; antifreeze compound or accelerators are unacceptable.
1. Portland Cement: Type 1 in accordance with ASTM C150; omit integral-type waterproofer if waterproof portland cement is used.
   a. Color: White; as approved by City.

2. Lime: Type S in accordance with ASTM C207; use pressure hydrated dolomitic lime providing that not less than 92 percent of active ingredients are completely hydrated.

3. Sand: Clean, white quartzite, essentially free of iron compounds in accordance with ASTM C144; not less than 100 percent passing No. 8 sieve.

4. Integral-Type Water Repellant: Stearate; as recommended by block manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General

1. Do not commence installation of the work of this Section until horizontal and vertical alignment of substrate is within 1/2 inch of plumb and the lines shown on the Drawings.

2. Install the work of this Section in strict accordance with the manufacturer's recommendations as approved by the City and with pertinent requirements of governmental agencies having jurisdiction, anchoring all components firmly into position plumb, square, level, and true to line and position.

3. Install glass blocks set in full mortar bed with joining reinforcing at 16 inches on center and in joints immediately above and below openings.

4. Keep the walls continually clean, preventing stains. If stains do occur, clean immediately.

B. Do not use chipped or broken units. If such units are discovered in the finished wall, the City may require their immediate removal and replacement with new units at no additional cost to the City.

C. Paint sills of all panels with heavy coat of asphalt emulsion and dry for minimum two hours before first mortar bed is placed.
D. Make provision for expansion and movement at jambs and heads of all panels; do not allow structural loads to bear on glass blocks. Do not provide expansion material at sill.

E. Mix mortar and apply in accordance with manufacturer’s recommendations.

3.02 CLEANING AND PROTECTION

A. Inspection and Adjustment:

1. Upon completion of the work of this Section, make a thorough inspection of installed masonry and verify that units have been installed in accordance with the provisions of the Contract Documents.

2. Remove excess sealer from glass surfaces immediately following application.

3. Remove excess mortar from faces of glass block at time joints are struck or tooled.

4. Make necessary adjustments.

5. Protect installed products until completion of the Work.

END OF SECTION
SECTION 05 12 00

STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and incidentals required and install structural steel, including bearing plates, miscellaneous shapes and plates, required to erect the structures as shown on the Drawings and as specified herein.

B. Furnish all anchor bolts with templates to be installed. Furnish and install nuts and washers for anchor bolts.

1.02 RELATED WORK

A. Grout is included in Section 03 60 00.

B. Metal Work - General Provisions are included in Section 05 50 00.

C. Field painting, except as specified herein, is included in Section 09 92 00.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01 32 19, erection drawings, detailed shop drawings, schedules and data for all structural steel. Shop drawings shall include sizes, dimensions, details of fabrication and construction, methods of assembly, connection details, and locations of hardware, anchors, and accessories.

B. Acceptance of fabrication drawings will be for general conformity to the Drawings and shall not relieve the Contractor of responsibility for proper fit of members, of connections not detailed on the Drawings, or for supplying all material required by the Contract Documents to complete the Work. Mark numbers painted on the shop-assembled pieces of steel shall be the same mark numbers used on the detailed shop and erection drawings.

C. Certified mill test reports of the structural steel and the bolting materials.

D. Qualifications and certifications for welders in accordance with AWS D1.1 for each process, position, and joint configuration on the shop and field welding procedures to be used.
E. Written Welding Procedure Specifications (WPS’s) in accordance with AWS D1.1 for each different welded joint proposed for use whether prequalified or qualified by testing.

F. Electrode data.

1.04 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC)
   1. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges
   2. AISC 325 - Steel Construction Manual
   3. AISC 326 - Detailing for Steel Construction
   4. AISC 335 - Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design
   5. AISC 341 - Seismic Provisions for Structural Steel Buildings
   6. AISC 348 - Specification for Structural Joints Using ASTM A325 or A490 Bolts
   7. AISC 360 - Specification for Structural Steel Buildings
   8. AISC 503 - Selected ASTM Standards for Structural Steel Fabrication

B. American Society for Testing and Materials (ASTM)
   1. ASTM A36 - Standard Specification for Carbon Structural Steel
   2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   4. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   5. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength
   6. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
7. ASTM A992 - Standard Specification for Structural Steel Shapes

8. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

9. ASTM F436 - Standard Specification for Hardened Steel Washers

10. ASTM F1554 - Standard Specification for Anchor Bolts, Steel 36, 55, and 105-ksi Yield Strength

11. ASTM F3125 – Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength

C. American Welding Society (AWS)

1. AWS A5.1 - Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding

2. AWS D1.1 - Structural Welding Code – Steel

D. Research Council on Structural Connections (RCSC)

1. Specification for Structural Joints Using High-Strength Bolts

1.05 QUALITY ASSURANCE

A. Structural steel shall be in accordance with the AISC Standard for Structural Steel Buildings - Allowable Stress Design and Plastic Design and the Code of Standard Practice for Steel Buildings and Bridges, unless otherwise specified herein.

B. Welding shall be done by certified welders and shall be in accordance with AWS D1.1 unless otherwise specified herein or in the AISC Standard.

1. WPS’s for each joint type shall indicate proper AWS qualification and be available where welding is performed.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store materials on skids and not on the ground. Pile and block materials so that they will not become bent or otherwise damaged. Do not allow metals to stain concrete.
B. Handle materials with cranes or derricks as far as practicable. Do not dump steel off cars or trucks nor handle in any other manner likely to cause damage.
PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural shapes, plates, rods and bars unless otherwise noted: ASTM A36

B. Wide flange beam: ASTM A992

C. Structural tube: ASTM A500, Grade B

D. Structural pipe: ASTM A53, Type S, Grade B

E. Welding electrodes: AWS A5.1, E70XX

F. High strength steel bolts, nuts and washers: ASTM A325X unless noted otherwise. When galvanized material is to be connected, use ASTM A325, mechanically galvanized to ASTM B695, Class 50, Type II.

G. Anchor bolts: ASTM A307

H. Washers: ASTM F436

I. Shop primer: As specified in Section 09 91 00 for non-galvanized member

J. Galvanizing: Zinc with 0.05 percent (minimum) nickel added

K. Galvanized surface primer: 95 percent zinc dust, organic vehicle primer

2.02 FABRICATION

A. Fabrication shall be in accordance with AISC requirements.

B. Perform shearing, flame cutting, and chipping carefully and accurately so as not to induce residual stresses in the metal being cut. Radii of re-entrant gas-cut fillets should be not less than ¾ inches.

C. Match mark materials for field assembly. Ream unmatched holes in shop assembly of field connections. Replace with a new piece any piece weakened by reaming to a point where the strength of the joint is impaired.

D. Welding of parts shall be done only where shown in the Contract Documents and by welders and welding operators qualified for the procedures used.
2.03 SURFACE PREPARATION AND SHOP COATINGS

A. Structural steel members and attachments shall be prepared and shop prime painted as specified in Section 09 91 00. Do not prime paint faying surfaces of slip critical connections.

B. Galvanize members and their attachments exposed to the weather or where frequent water contact is likely. Galvanize other members as indicated on the Drawings. Galvanizing shall be done after fabrication and in accordance with ASTM A123.

C. Hardware galvanizing shall be in accordance with ASTM A153 and Section 09 91 00.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. Shop and field welding and structural assemblies shall meet the requirements of AISC 325 and AISC 326.

2. Measurements and dimensions shall be verified at the Site.

3. Bolt holes shall be 1/16 inch larger than the nominal size of bolts. Where thick metals are indicated, holes shall be sub-punched and drilled or reamed.

4. Provide slotted holes where shown on the Drawings and where needed for installation and thermal expansion.

5. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators.

6. Bolts shall not be permitted to drift and holes shall not be enlarged to correct misalignment. In the event of mismatching of holes, new materials shall be provided.

7. Structural steel completely encased in concrete shall not be galvanized or painted and shall have a clean surface for bonding to concrete.

8. Damaged structural steel shall be replaced. Use of salvaged, reprocessed, or scrap materials shall not be permitted.
9. Furnish and install temporary bracing to provide stability during erection and to prevent distortion or damage to the framing due to wind, seismic, or erection forces. Remove temporary bracing when erection is complete.

10. No field cutting or modification of any structural steel member shall be allowed without prior written approval from the Engineer.

B. Bolted and Welded Connections:

1. Where bolted connections are indicated, they shall comply with AISC Specifications for Framed Beam Connections for bearing type connections. The threaded portion of bolts shall not occur at shear planes.

2. Make all steel-to-steel connections by high strength bolting except where field welding is shown or specified. Unless otherwise shown, provide not less than two 3/4-inch bolts per connection and use not less than 1/4-inch thick clip angles or plates. Lock nuts or lock washers shall be provided under nuts.

3. Tighten bolted connections designated as bearing-type connections to the snug tight condition. Tighten all other bolted connections to full tension by turn-of-nut or calibrated wrench tightening.

4. Each bolting crew and welder shall be assigned an identification mark. This mark shall be made at each completed connection with a paint stick.

5. Field welding shall be done only where shown or specified and only by welders qualified for the procedures used. Weld only in accordance with approved WPS’s that are to be available to welders and inspectors during the production process. No welding shall be done when surfaces are wet, exposed to rain or wind, or when welders are exposed to inclement conditions that will hamper good work.

6. Welding shall comply with AWS Code for Arc Welding in Building Construction, Section 4, Workmanship. Electrodes shall be matching according to AWS.

3.02 CORROSION PROTECTION

A. Unless otherwise indicated, all structural steel including that used in the fabrication of process equipment shall be surface-prepared and coated in accordance with Division 9 and shall include the following operations:

1. Exterior and interior edges of flame-cut pieces shall be ground smooth.

2. Sharp edges and punched holes shall be ground smooth.
3. Uneven or rough welds shall be ground smooth.

B. After erection, prime paint abrasions, field welds and unprimed surfaces using shop primer except surfaces designated to be unpainted or surfaces in contact with concrete.

C. After erection, prime paint abrasions and field welds on galvanized surfaces with galvanized surface primer.

D. After installation, damaged surfaces of shop-primed structural steel shall be cleaned and touched-up with same material used for shop coat.

3.03 PAINTING

A. All structural steel, connections, accessories, anchors and bolts shall be painted per Sections 09 91 00 and 09 92 00.

B. Colors shall be as approved by the City.

END OF SECTION
SECTION 05 50 00

METAL WORK - GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to complete and install fabricated metal items. Furnish all supplementary items, appurtenances, and accessories necessary for their proper installation.

B. Furnish all anchors, sleeves, bolts, brackets, clips, inserts, angles, loose lintels, tubing, bar stock, plates and other miscellaneous metal products and accessories not distinctly specified under other sections or on Drawings but necessary to complete the Work.

1.02 RELATED WORK

A. Miscellaneous Metal Items are included in Section 05 51 50.

B. Shop and Field Painting are included in Division 9.

1.03 REFERENCE STANDARDS

A. Aluminum Association (AA)
   1. AA ASD Aluminum Standards and Data
   2. AA 46 Standards for Anodized Architectural Aluminum
   3. Specifications for Aluminum Structures

B. American Institute of Steel Construction (AISC)

C. American National Standards Institute (ANSI)
   1. ANSI B18.22.1 - Plain Washers
D. American Society for Testing & Materials (ASTM)

1. ASTM A36 - Standard Specification for Carbon Structural Steel

2. ASTM A48 - Standard Specification for Gray Iron Castings

3. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

4. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished


6. ASTM A125 - Standard Specification for Steel Springs, Helical, Heat-Treated

7. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

8. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High-Temperature or High Pressure Service and Other Special Purpose Applications

9. ASTM A194 - Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

10. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes


12. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength


14. ASTM A320 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service

15. ASTM A489 - Standard Specification for Carbon Steel Eyebolts
16. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

17. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts

18. ASTM A575 - Specification for Steel Bars, Carbon, Merchant Quality, M-Grades


20. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable


22. ASTM B98 - Standard Specification for Copper-Silicon Alloy Rod, Bar and Shapes

23. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate


25. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes


27. ASTM B438 - Specification for Bronze Powder Metallurgy (P/M) Bearing (Oil-Impregnated)

28. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

29. ASTM D1187 - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal

30. ASTM F436 - Standard Specification for Hardened Steel Washers

32. ASTM F1267 - Standard Specification for Metal, Expanded, Steel

33. ASTM F3125 – Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength

E. American Welding Society (AWS)
   1. AWS D1.1 Structural Welding Code - Steel
   2. AWS D1.2 Structural Welding Code - Aluminum
   3. AWS A2.4 Standard Symbols for Welding, Brazing, Nondestructive Examination

F. Federal Specifications
   1. MIL-G-18015 - Gratings, Metal, Other Than Bar Type (Shipboard use)

G. Society for Protective Coatings (SSPC)
   1. SSPC-SP 1 - Surface Preparation Specification No.1 “Solvent Cleaning”
   2. SSPC-SP 2 - Surface Preparation Specification No.2 “Hand Tool Cleaning”
   3. SSPC-SP 3 - Surface Preparation Specification No.3 “Power Tool Cleaning”
   4. SSPC-SP 6 - Surface Preparation Specification No.6 “Commercial Blast Cleaning”
   5. SSPC-SP 10 - Surface Preparation Specification No.10 “Near-White Blast Cleaning”

1.04 SUBMITTALS

A. Prior to fabrication, submit shop drawings, erection or setting drawings, product data, etc., in accordance with Section 01 32 19, showing methods of assembly, anchorage and connection to other members. Indicate welded connections in accordance with AWS A2.0. Shop drawings will be required for all items included under this Section.

B. Submit samples of material or fabricated items if requested by the Engineer.
1.05 QUALITY ASSURANCE

A. Coordinate completely the work of this Section with the work of other Sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before fabrication and installation of the items specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver items to be incorporated into the work of other trades in sufficient time to be checked prior to installation.

B. Deliver anchorage devices with setting drawings, templates and instructions for installation.

C. Store delivered items off the ground and protected from dirt and weather.

D. Repair items that have become damaged or corroded to the satisfaction of the City prior to incorporating them into the work.

E. Refer to Section 01 65 00 for additional requirements.

PART 2 - PRODUCTS

2.01 STEEL FABRICATIONS

A. Materials

1. Structural steel shapes, plates, checkered plate, bars and rods: ASTM A36

2. Steel plates - bent or cold-formed: ASTM A283, Grade C

3. Welded and seamless rectangular steel tubing: ASTM A500, Grade B

4. Steel pipes: ASTM A53, Type E or S, Grade A. Pipes for sleeves and exterior locations shall be galvanized.

5. Carbon steel bolts, studs, nuts and washers: ASTM A307

6. High strength bolts, studs, nuts and washers for structural steel:

   a. Elevated temperature exposures: ASTM A325-Type I
   b. General application: ASTM A325-Type I or II
c. Exterior application: ASTM A325 Mechanically Galvanized per ASTM B695, Class 50, Type II

7. Headed Anchor Studs: Nelson Type H4L or S3L by Nelson Stud Welding Company, or equal

8. Welding Materials AWS D1.1

9. Galvanizing
   a. General: ASTM A123
   b. Hardware: ASTM A153
   c. Assembled steel products: ASTM A123

10. Shop and Touch-up Primer: SSPC Paint 15 Type I red oxide

B. Fabrication

1. See general fabrication requirements in Paragraph 2.05.

2. Fabricate miscellaneous steel in accordance with the Drawings. Fabrications include beams, angles, support brackets, splice plates, anchor bolts and any other miscellaneous steel called for on the Drawings and not otherwise specified.

3. Checkered plate shall have a pattern of raised lugs on one face and shall be smooth on the opposite face. Lugs shall be a minimum of one inch in length and raised a minimum of 0.050 inch above the surface. The lugs shall be located in a pattern in which the lugs are oriented at 90 degrees from the adjacent lugs in two orthogonal directions. The rows of lugs shall be oriented at 45 degrees from the edges of the plates. The minimum plate thickness shall be 1/4 inch.

4. Thoroughly clean steel fabrications of all loose mill scale, rust, grease or oil, moisture, dirt, or other foreign matter and finish in compliance with Paragraph 2.01.C.

C. Finishes

1. Surface preparation and painting shall be as specified in Division 9.

2. As soon as possible after erection, touch up any scraped, abraded or unpainted surfaces using primer as specified for shop coats.
2.02 STAINLESS STEEL FABRICATIONS

A. Materials

1. Plates, sheets and structural shapes:
   a. Exterior, submerged or industrial: ASTM A167, Type 316
   b. Interior and architectural: ASTM A167, Type 304

2. Pipes: ASTM A312

3. Bolts, nuts and washers: ASTM A276, Type 316 or Type 304

B. Fabrication

1. See general fabrication requirements in Paragraph 2.05.

2.03 ALUMINUM FABRICATIONS

A. Aluminum Framing & Fabrications

1. Materials
   a. Aluminum structural shapes and plates: Alloy 6061-T6
   b. Sheet Aluminum: ASTM B209, 5052 Alloy, H32 or H22 Temper
   c. Extruded aluminum pipe: ASTM B210, Alloy 6105-T5, 6063-T6 or 6061-T6
   d. Fasteners: Stainless Steel ASTM A276, Type 316 or Type 304

2. Welding Materials: As per AWS D1.2

3. Fabrication

   a. See general fabrication requirements in Paragraph 2.05.

   b. Fabricate miscellaneous aluminum shapes and plates as shown. Furnish welded and mitered angle frames and other fabrications complete with welded anchors attached. Furnish all miscellaneous aluminum shown but not otherwise detailed. Structural shapes and extruded items shall comply with the dimensions on the Drawings within the tolerances published by the Aluminum Association.
c. Weld aluminum work on the unexposed side when possible in order to prevent pitting or discoloration of exposed aluminum surfaces.

4. Finishes

a. All exposed aluminum surfaces shall have fabricator's standard mill finish unless otherwise specified. Apply a coat of methacrylate lacquer to all aluminum before shipment.

b. Provide anodized finish where specified.

2.04 ANCHORS, BOLTS, AND FASTENING DEVICES

A. The bolts used to attach the various members to the anchors shall be the sizes shown or required. Attach 316 stainless steel to concrete by means of stainless steel machine bolts. Bolts and nuts shall be hexagon type using standard unit dimensions.

B. For structural purposes, unless otherwise noted, drilled-in concrete anchors shall be adhesive capsule, adhesive or expansion type anchor bolts. Drilled-in anchors shall have ICBO certified permissible values.

1. Adhesive Anchors shall be a two-part stud and cartridge resin anchoring system. Stud assemblies shall be as indicated on the Drawings and shall include all-thread anchor rod with nut and washer, or deformed reinforcing steel complying with the requirements of Division 3. Provide manufacturer's recommended drive units and adaptors for installing studs. Install anchors in full compliance with the manufacturer's recommendations. Adhesive epoxy system for threaded rod anchors and deformed rebar dowels shall be Simpson SET, Covert CIA-Gel 7000, HILTI HIT HY 150 MAX, Sikadur AnchorFix-4, Epcon C6 or approved equivalent.

2. Expansion Anchors shall be wedge type anchors of the sizes noted on the Drawings complete with nuts and washers. Unless otherwise noted, provide zinc plated carbon steel anchors. Stainless steel anchors, where required, shall be all AISI Type 316 construction. When the length or embedment of the bolt is not noted on the Drawings, provide length sufficient to place the wedge and expansion sleeve portion of the bolt at least one inch behind the reinforcing steel within the concrete or as recommended by the manufacturer, whichever is larger.

   a. Acceptable Manufactures: Hilti: "Kwik-Bolt II", ITW Ramset/Red Head: "Trubolt Wedge" or equal

C. Bolt Requirements: Bolts shall comply with the following:
1. The nuts shall be capable of developing the full strength of the bolts. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads. Bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.

2. The length of all bolts shall be such that after joints are made up, each bolt shall extend through the entire nut, but in no case more than 1/2-inch beyond the nut.

D. Standard Service Bolts (Not Buried or Submerged): Except where otherwise indicated, bolts and nuts shall be steel and shall be galvanized after fabrication. Threads on galvanized bolts and nuts shall be formed with suitable taps and dies such that they retain their normal clearance after hot-dip galvanizing. Except as otherwise indicated herein, steel for bolts, anchor bolts and cap screws shall be in accordance with the requirements of ASTM A325 or threaded parts of ASTM A36. ASTM A320 and A325 bolts and nuts shall not be galvanized.

E. Buried or Submerged Bolts: Unless otherwise indicated, bolts, anchor bolts, nuts and washers shall be of Type 316 stainless steel.

F. Flange bolts for standard service shall be ASTM A193, Grade B7 with ASTM A194 Grade 1 nuts. Flange bolts for buried or submerged service shall be ASTM A193 Grade B8M with ASTM A194 Grade 8 nuts. Bolts and nuts shall have hexagonal dimensions in accordance with ANSI/ASME B18.2.1.

G. Anchor bolts shall comply with the following:

1. Unless otherwise specified, anchor bolts shall be fabricated of materials as follows:

<table>
<thead>
<tr>
<th>Material</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel bolts</td>
<td>ASTM A325</td>
</tr>
<tr>
<td>Fabricated steel bolts</td>
<td>ASTM A36</td>
</tr>
<tr>
<td>Stainless steel bolts, nuts, washers</td>
<td>ASTM A320, type 316</td>
</tr>
</tbody>
</table>

2. Anchor bolt holes in equipment support frames shall not exceed the bolt diameters by more than 25 percent, up to a maximum oversizing of 1/4-inch. Unless otherwise indicated, minimum anchor bolt diameter shall be 1/2-inch. Anchor bolts for equipment shall be 316 stainless steel and shall be provided with leveling nuts that shall be tightened against flat surfaces to not less than 10 percent of the bolt’s safe tensile stress.

3. Tapered washers shall be provided where mating surface is not square with the nut.
H. Fasteners and Accessories: Furnish anchors, fasteners, washers, straps, and accessories as required for a complete and finished installation. Fasteners shall be stainless steel or galvanized steel as appropriate and approved for the location.

2.05 FABRICATION - GENERAL

A. Fabricate, fit and assemble items in largest practical sections for delivery to site.

B. Form all miscellaneous metal work true to detail, with clean, straight, sharply defined profiles, and smooth surfaces of uniform color and texture. Provide fabrications free from defects impairing strength or durability. Drill or punch holes and smooth edges. Ease exposed edges to a small, uniform radius. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.

C. Supply components required for anchorage of fabrications. Connections and accessories shall be of sufficient strength to safely withstand stresses and strains to which they will be subjected. Steel accessories and connections to steel or cast iron shall be steel, unless otherwise specified. Threaded connections shall be made so that the threads are concealed by fitting.

D. Welded joints shall be rigid and continuously welded or spot welded as specified or shown. Dress the face of welds flush and smooth. Continuously weld and grind smooth welds that will be exposed. Exposed joints shall be close fitting and jointed where least conspicuous. Conceal fastenings where practical. Punch or drill for temporary field connections and for attachment of the work of other trades.

E. Welding of parts shall comply with the latest edition of the AWS structural welding code for steel (D1.1) or aluminum (D1.2) as appropriate and shall only be done where shown, specified, or permitted by the Engineer. Welding shall be performed only by welders certified to perform the required welding in compliance with the requirements of the AWS Code. Component parts of built-up members to be welded shall be adequately supported and clamped or held by other adequate means to hold the parts in proper relation for welding.

F. Form changes in direction by bending or using prefabricated elbow fittings where feasible.

G. Castings shall be of good quality, strong, tough, even-grained, smooth, and free from scale, lumps, blisters, sand holes and defects of any kind, which render them, unfit for the service for which they are intended. Thoroughly clean castings. Castings may be subjected to a hammer inspection in the field by the City’s Material Inspector. All finished surfaces shown on the Drawings
and/or specified shall be machined to a true plan surface allowing pieces to seat at all points without rocking. Make allowances in the patterns so that thicknesses specified or shown will not be reduced in obtaining finished surfaces. Castings will not be acceptable if the actual weight is less than 95 percent of the theoretical weight computed from the dimensions shown. Provide facilities for weighing castings in the presence of the Engineer and show true weights, certified by the supplier.

H. Shop painting will not be required for galvanized metal, stainless steel, aluminum, copper, brass and bronze unless specifically specified.

I. Fabrication Tolerances:

1. Squareness: 1/8 inch maximum difference in diagonal measurements
2. Offset between Faces: 1/16 inch maximum
3. Misalignment of Adjacent Members: 1/16 inch maximum
4. Bow: 1/8 inch maximum in 48 inches
5. Deviation from Plane: 1/16 inch maximum in 48 inches

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. Verify dimensions, location, and elevation in field as required prior to fabrication.

B. Install all items furnished except items to be embedded in concrete that shall be installed under Division 3. Items to be attached to concrete after such work is completed shall be installed in compliance with the details shown. Furnish to appropriate trades all anchors, sockets, or fastenings required for securing work to other construction.

C. Set metal work level, true to line and plumb as indicated.

D. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

E. Weld field connections and grind smooth where practicable. Clean and strip primed, steel items to bare metal where site welding is required. Conceal fastenings where practicable.
F. Secure metal to wood with lag screws, of adequate size, with appropriate washers.

G. Touch up abrasions to finish or primer coatings immediately after erection and prior to both final coating and final acceptance.

H. Break contact between dissimilar metals as shown on the Drawings or as specified in Paragraph 3.01.I.

I. Field apply coatings for installation of metal fabrications according to the following schedule.

1. Embedded items and portions:
   a. All steel surfaces in contact with exposed concrete shall receive a protective coating of an approved heavy bitumastic troweling mastic applied in compliance with the manufacturer’s instructions prior to installation.
   b. Where aluminum contacts a dissimilar metal, apply a heavy brush coat of zinc-chromate primer followed by two coats of aluminum metal and masonry paint to the dissimilar metal.
   c. Where aluminum contacts concrete, apply a heavy coat of zinc chromate primer to the surface of the aluminum.
   d. Where aluminum contacts wood, apply two coats of aluminum metal and masonry paint to the wood.

2. Exposed items and parts shall be field painted as per Section 09 92 00.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required to provide and install miscellaneous metal items and accessories as shown on the Drawings, as specified herein and as required to complete the work.

1.02 RELATED WORK

A. Grout is included in Section 03 60 00.
B. Metal Work - General Provisions are included in Section 05 50 00.
C. Shop priming and field painting are included in Division 9.

1.03 REFERENCE STANDARDS

A. See Section 05 50 00 for applicable reference standards.
B. Occupational Safety and Health Standards (OSHA)

1.04 SUBMITTALS

A. Submit to the Engineer shop drawings, product data, and samples in accordance with Section 01 32 19 and as specified below.
   1. Layout plans, elevations, sections, and connection details of all items and components to be furnished under this Section.
   2. Setting diagrams for installation of anchors, location of pockets, weld plates, flanges and like materials for attachments of components to structure(s).
   3. Product data for all accessories and supplementary items.
   4. Samples if requested by the Engineer.
   5. Color/finish samples if requested by the Engineer.
1.05 QUALITY ASSURANCE

A. Coordinate completely the work of this Section with the work of other Sections. Verify at the Site both the dimensions and work of other trades adjoining items of work in this Section before fabrication and installation of the items specified.

B. Furnish to the pertinent trades all items included under this section that are to be built into the work of other Sections.

C. All welding shall be performed by qualified welders and shall conform to the applicable AWS welding code.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver items to be incorporated into the work of other trades in sufficient time to be checked prior to installation.

B. Store delivered items off the ground and protect from dirt and weather.

C. Repair items that have become damaged or corroded to the satisfaction of the City prior to incorporating them into the Work.

PART 2 - PRODUCTS

2.01 MATERIALS

Materials for steel, stainless steel, and aluminum items shall be in accordance with Section 05 50 00.

2.02 FIXED STEPS

A. Fixed steps and accessories shall comply with all applicable requirements of OSHA, 29 CFR 1910, ANSI A14.3, and the Contract Documents, including applicable Standard Drawings.

B. Fixed steps shall be as follows:

1. Polypropylene steel reinforced steps shall be made of copolymer polypropylene plastic that encapsulates a ½-inch diameter grade 60 steel reinforcing rod. Steel reinforcing shall conform to the requirements of ASTM A615, and copolymer polypropylene plastic shall conform to requirements of ASTM D4101-82.

2. Steps shall have serrated thread and be designed to withstand pullout forces of 1,500 pounds.

3. Spacing between two steps shall not exceed 12 inches.
4. Width shall be at least 15 inches.

5. Step shall protrude 6 inches minimum and 8 inches maximum from face of the concrete wall.

6. Step shall have at least 3 3/8" embedment inside concrete.

2.03 LIFTING AND HANDLING DEVICES

A. Eye Bolts:

1. Eye bolt sizes shall be as shown on the Drawings.

2.04 CHECKERED PLATES

A. Checkered plate shall have a pattern of raised lugs on one face and shall be smooth on the opposite face. Lugs shall be a minimum of one inch in length and raised a minimum of 0.050 inch above the surface. The lugs shall be located in a pattern in which the lugs are oriented at 90 degrees from the adjacent lugs in two orthogonal directions. The rows of lugs shall be oriented at 45 degrees from the edges of the plates. Plate thickness shall be as shown on the Drawings, but in no case less than 1/4 inch.

B. Steel checkered plates shall be hot dipped galvanized after fabrication.

C. Checkered plates to be installed on utility trenches within the building shall be sized such that the weight of each panel is 75 lbs. or less.

2.05 PUSH TROLLEY

A. Push trolley shall be geared type and rated for 1-ton capacity.

B. It shall be made of steel and coated with epoxy.

C. Trolley shall have dual tread wheel and lifetime lubricated shielded ball bearings.

D. Hand chain drop shall be up to 1’ from the bottom of the floor.

E. Trolley shall accept hook mounted hoists and be easily adjustable to fit any beam flange.

F. Trolley shall be Model CBTG by Columbus McKinnon (CM) or approved equal.
2.06 FABRICATION - GENERAL

A. Fabrication details shall be as shown on the Drawings and as specified herein. Form metal work true to detail, with clean, straight, sharply defined profiles, and smooth surfaces of uniform color and texture. Provide fabrications free from defects. Drill or punch holes and smooth edges. Ease exposed edges to a small, uniform radius. Fabricate supplementary pieces necessary to complete each item though such pieces are not shown or specified.

B. For steel ladder rungs or capped top ends of side rails, grind welds on exterior face of side rails or stringers smooth. Accurately fabricate joints for neat, tight fit.

C. Welding shall comply with the latest edition of the applicable AWS code. Welding shall be performed only by welders certified to perform the required welding in compliance with the requirements of the AWS code. Component parts of built-up members to be welded shall be adequately supported and clamped or held by other adequate means to hold the parts in proper relation for welding.

D. Attachments not made by welding shall be made with self-locking Type 316 stainless steel fasteners.

E. Additional requirements for fabrications are provided in Section 05 50 00.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

Install fabrications, plumb, square and level and securely anchored to supports. Smooth and adjust miters and field cuts to create tight joints.

3.02 PAINTING

Provide painting in accordance with Sections 09 91 00 and 09 92 00.

3.03 CLEANING

A. As work progresses, remove debris and leave installation sites broom clean.

B. Prior to final acceptance, clean ladders of any mud or other adherents.

END OF SECTION
SECTION 05 53 00
METAL GRATINGS AND COVER PLATES

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required to install metal gratings and floor cover plates along with embedded or attached support frames as shown in the Drawings and as required.

1.02 RELATED WORK

Metal Work – General Provisions are included in Section 05 50 00.

1.03 SUBMITTALS

A. Submit to Engineer detailed Shop Drawings, in accordance with Section 01 32 19, showing sizes of members, method of assembly, anchorage and connection to other members. Submit shop drawings to the Engineer for approval before fabrication.

B. Submit manufacturer's product data for gratings and plates including span and deflection tables and details of construction.

C. Submit manufacturer's installation instructions.

D. Submit samples 12 inches by 12 inches in size, illustrating surface finish, color, texture, and jointing details when requested by the City.

1.04 REFERENCE STANDARDS

A. Aluminum Association

1. Aluminum Design Manual

2. Aluminum Structures: A Guide to Their Specifications and Design

B. American Society for Testing and Materials (ASTM)

1. ASTM A36 - Standard Specification for Carbon Structural Steel

2. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished

4. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware


6. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

7. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes


10. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes


C. American Welding Society (AWS)

1. AWS A2.4 - Standard Symbols for Welding, Brazing, Nondestructive Examination

2. AWS D1.1 - Structural Welding Code - Steel

3. AWS D1.2 - Structural Welding Code - Aluminum

1.05 QUALITY ASSURANCE

A. The work of this Section shall be completely coordinated with the work of other Sections. Verify at the work site the dimensions and the work of other trades adjoining items of work in this Section before fabricating or installing the items specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.
PART 2 - PRODUCTS

2.01 RECTANGULAR BAR GRATING AND APPURTENANCES

A. General:

1. Provide grating of the minimum depths and bearing bar thicknesses noted on the Drawings or as required meeting the requirements of this Section, whichever is more stringent. Grating bearing bars shall be spaced at 1 3/16 inches on center and cross bars shall be spaced at 4 inches on center.

2. Grating cross bars shall be attached to the bearing bars with interlocked pressed joints having no exposed welding.

3. Grating provided shall meet or exceed the following load and deflection criteria for the number of spans and span lengths at which it will be utilized:
   
a. The span at which the grating is installed shall not exceed the fabricator's maximum recommended span.

   b. The grating shall produce a deflection of 1/4-inch or less under a uniform live load of 100 pounds per square foot.

   c. Grating shall produce a deflection of 3/8-inch or less under a concentrated live load of 500 pounds applied at mid-span.

4. Openings 2-inch or greater in diameter/dimension and grating edges shall be banded with a bar of the same depth and thickness as the bearing bars. Cut bearing or cross bars shall be welded to the banding bar.

5. For openings larger than 12 inches and smaller than 20 inches in diameter, at least 4-inch deep banded bar shall be provided. For openings larger than 20 inches in diameter, 6-inch deep banded bar shall be provided.

B. Aluminum Grating:

1. Unless otherwise indicated, grating shall be fabricated of aluminum.

2. Aluminum grating bearing bars shall be of alloy 6061-T6 conforming to ASTM B221. Aluminum grating cross bars shall be of an alloy conforming to either ASTM B221 (extrusions) or B210 (drawn).

3. Bearing bars shall be punched to receive the cross bars. After insertion in the bearing bars, cross bars shall be deformed by a hydraulic press or similar means to lock the bars permanently into the bearing bar openings. Fabrication methods employing bending or notching of bearing or cross bars will not be permitted.
4. Aluminum grating for large area shall be provided in multiple panels with maximum plan area of 60 square feet or as shown on the Drawings.

5. Aluminum grating shall be Series GAA as supplied by McNichols Co. or approved equivalent.

C. Steel Grating:

1. Steel grating shall be used only where indicated on the Drawings and where H-20 traffic loading is required or specified.

2. Steel grating bearing bars and cross bars shall be of welding quality mild carbon steel conforming to ASTM A1011.

3. Steel grating shall be hot-dip galvanized after fabrication. Notching, slotting, or cutting the top or bottom edges of bearing bars to receive cross bars will not be permitted unless each intersection of bars is fully welded to restore each bearing bar to its full cross-sectional strength.

4. Steel grating for large area shall be provided in multiple panels with maximum plan area of 30 square feet or as shown on the Drawings.

5. Steel grating shall be Series GAA as supplied by McNichols Co. or approved equivalent.

D. Grating clamps, nuts, bolts, washers and other fastening devices for grating and grating supports shall be Type 304 stainless steel.

1. Provide saddle clip grating anchors. Maximum spacing shall be 3 feet.

2. Hinges and latches shall be Type 304 stainless steel.

2.02 COVER PLATES

A. Unless otherwise noted on the Drawings, cover plates shall be hot dipped galvanized steel tread plate or aluminum alloy 6061-T6 having raised lugs on one surface to provide improved traction.

1. Unless otherwise noted, provide 1/4-inch plate thickness minimum.

2. Lugs shall be a minimum of one inch in length and raised a minimum of 0.050 inch above the surface. The lugs shall be located in a pattern in which the lugs are oriented at 90 degrees from the adjacent lugs in two orthogonal directions. The rows of lugs shall be oriented at 45 degrees from the edges of the plates.

B. Plate, frames, anchors, and supports shall be all aluminum construction for aluminum cover plates and galvanized steel for galvanized cover plates.
Frames and supports embedded in concrete shall be installed per Sections 05 50 00 and 03 30 00 and as shown on the Drawings.

C. Where noted on the Drawings, stainless steel cover plate shall be 1/4-inch thick, Type 304 stainless steel. Frames, anchors, and supports shall be as shown on the Drawings.

D. Cover plate fastening devices and hardware shall be Type 304 stainless steel.

E. Unless otherwise specified, finish shall be mill finish.

F. Cover plates to be installed on utility trenches within the building shall be sized such that the weight of each panel is 75 lbs. or less.

2.03 FABRICATION

A. Provide work true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture free from defects impairing strength or durability.

B. Field verify dimensions prior to fabrication.

C. Provide connections and accessories of sufficient strength to withstand safely the stresses and strains to which they will be subjected. Threaded connections shall be made so that the threads are concealed by fitting.

D. Angle frames for grating and cover plates shall be welded and mitered with welded strap anchors attached. Frame shall be sized and designed such that the gratings or cover plates are flush with the finished surface.

E. Welded joints shall be rigid and continuously welded or spot welded as specified in the Contract Documents. Dress the face of welds flush and smooth. Exposed joints shall be close fitting and located where least conspicuous.

F. Welding of parts shall comply with the latest edition of AWS. Welding only to be done where specified in the Contract Documents. Welding shall be done by welders certified to perform welding in accordance with the requirements of the AWS Code. Component parts of built-up members to be welded shall be adequately supported and clamped or held by other adequate means to hold the parts in proper relation for welding.

G. Weld steel work on the unexposed side when possible in order to prevent pitting or discoloration.

H. Apply one coat of methacrylate lacquer to all aluminum before shipment from the factory.
I. Coordinate the layout of grating and cover plate with work of other Sections to provide openings for approved mechanical equipment, operators, and other items that require penetrations or openings in the grating and cover plate.

J. Refer to Section 05 50 00 for additional applicable requirements.

PART 3 - EXECUTION

3.01 INSPECTION

Field verify dimensions of constructed facilities or openings as required prior to fabrication of gratings and cover plates.

3.02 INSTALLATION

A. Field cutting of finished surfaces is not allowed unless specifically approved by the City. When cutting is approved, use mechanical cutting tools; do not use flame cutting tools.

B. Secure grating with fastening devices as specified to prevent movement, except where removable grating is called for on Drawings.

C. Where aluminum contacts a dissimilar metal, field-apply a heavy brush coat of zinc-chromate primer followed by two coats of aluminum metal and masonry paint to the dissimilar metal.

D. Where aluminum contacts concrete, field-apply a heavy brush coat of zinc chromate primer to the concrete. For embedded items, coat the embed.

3.03 FIELD QUALITY CONTROL

A. Tolerances

1. Maximum space between adjoining or abutting sections: 1/4 inch.

2. Maximum variation from top surface plane of adjoining or abutting sections or structure: 1/8 inch.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to complete and install rough carpentry for the following applications with all supplementary items necessary for their proper installation:

1. Wood framing with plates, studs, joists, rafters, purlins, hangers, and similar framing elements.

2. Wood blocking, furring, stripping, backing, and nailers as indicated or otherwise required for securing other work.

3. Plywood sheathing, board sheathing, sidings and starter boards.

4. Rough hardware, anchors, hangers, supports, framing devices, straps, connectors, and appurtenances to the work of this Section.

1.02 RELATED WORK

A. Concrete Work is included in Section 03300.

B. Reinforced Concrete Block Masonry is included in Section 04 22 00.

C. Metal Work – General Provisions are included in Section 05 50 00.

1.03 STANDARD SPECIFICATIONS

Except as otherwise indicated in this Section of the Specifications, the Contractor shall comply with the Standard Specifications for Public Works Construction (SSPWC).

1.04 CODES

A. The work of this Section shall comply with the current editions of the following codes.

1. California Building Code
1.05 REFERENCE STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the work of this Section:

1. Federal Spec. FF-B-561 Bolts, (Screw), Lag
2. Federal Spec. FF-B-575 Bolt, Hexagon and Square
3. Federal Spec. FF-B-584 Bolts, Square Neck and Tee Head
5. Federal Spec. FF-N-105 Nails, Brads, Staples and Spikes; Wire, Cut, and Wrought
7. Federal Spec. FF-S-111 Screw, Wood
8. Federal Spec. FF-S-1362 Stud, Plain, General Purpose
9. AITC 104 Timber Construction Manual, Typical Construction Details
10. AITC 105 Timber Construction Manual, Recommended Practice for the Erection of Structural Timber Framing
11. AWPA C1 AWPA Manual of Recommended Practice, Standard For Preservative Treatment by Pressure Process - All Timber Products
12. RIS Standard Specifications for Grades of California Redwood Lumber by the Redwood Inspection Service
13. SPIB Standard Grading Rules for Southern Pine Lumber of the Southern Pine Inspection Bureau
14. WCLIB Standard No. 17 Grading Rules for West Coast Lumber, West Coast Lumber Inspection Bureau
1.06 SUBMITTALS

A. The following shall be submitted in compliance with Section 01 32 19:

1. Manufacturer's product data for all products proposed to be used under this Section, including lumber, plywood, hangers, supports, connectors, anchors, fasteners, rough hardware, appurtenances, and accessories.

2. Framing plans and elevations showing spacing, locations and sizes of members.

3. Framing details.


1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.

B. Lumber shall be carefully stored in a manner that will prevent damage and in an area that is protected from the deleterious effects of the elements.

C. Additional requirements for delivery, storage and handling are specified in Section 01 65 00.

PART 2 - PRODUCTS

2.01 GENERAL

A. Only lumber certified as complying with the indicated requirements shall be provided.

B. Lumber shall be new, of current manufacture, and shall be the products of reputable mills specializing in producing such lumber.

C. Lumber and plywood shall comply with SSPWC Subsection 204-1 and this Section.

2.02 UNTREATED LUMBER

A. Lumber shall be graded in accordance with the rules of one of the following associations: "Grading Rules for Southern Pine Lumber" of the Southern Pine
Inspection Bureau; "Standard No. 17 Grading Rules for West Coast Lumber" of the West Coast Lumber Inspection Bureau (WCLIB); or "Western Lumber Grading Rules" published by Western Wood Products Association.

B. Each piece of lumber shall bear the indicated official grade mark.

C. Lumber shall be dressed to size in accordance with the standards of the association under which the lumber is graded, except as otherwise indicated. Lumber shall be S4S unless otherwise indicated.

D. Except where otherwise indicated, lumber shall be air or kiln dried to a moisture content of not more than 19 percent and not less than 1 percent.

E. Grades of framing lumber shall comply with the following:

<table>
<thead>
<tr>
<th>Use</th>
<th>WCLIB Grade</th>
<th>Grading Rule</th>
<th>Stress $F_b$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rafters, joists, studs 2 x 6 and larger, miscellaneous framing, ledgers, etc.</td>
<td>No. 1</td>
<td>Para. 123-b</td>
<td>1000 psi</td>
</tr>
<tr>
<td>Studs and plates 2 x 4, 3 x 8, 3 x10, and 4 x 4</td>
<td>Construction</td>
<td>Para. 122-b</td>
<td>1000 psi</td>
</tr>
<tr>
<td>Beams and Stringers</td>
<td>Select Structure</td>
<td>Para. 130-a</td>
<td>1600 psi</td>
</tr>
<tr>
<td>Posts and Timber</td>
<td>No. 1</td>
<td>Para. 131-b</td>
<td>1200 psi</td>
</tr>
</tbody>
</table>

2.03 REDWOOD

Redwood shall conform to requirements of the "Standard Specifications for Grades of California Redwood Lumber" of the Redwood Inspection Service. Redwood lumber used for foundation plates or in contact with concrete shall be Foundation Grade, S4S.

2.04 TREATED LUMBER

A. Lumber shall be treated with preservatives in compliance with SSPWC Subsection 204-2 and this Section.

B. Each piece of treated lumber shall bear the approval mark of an approved testing agency.

C. Kiln-dried lumber shall be treated with a water-borne preservative and shall have a maximum moisture content of 15 percent after treatment.
D. Wood nailing blocks, sills, and plates resting on or embedded in concrete or masonry within 18 inches of grade shall be pressure treated in accordance with AWPA C1.

E. Two coats of preservative shall be applied at least 2 hours before installation to surfaces that come in contact with or are set close to concrete and plaster. Tank dipping or pressure treating may be used.

F. Wherever necessary to cut, notch, dap, drill, or frame treated lumber, newly cut or bored surfaces shall be treated with 2 heavy coats of the same preservative used in the original treatment. The minimum penetration depth shall be 1/4-inch.

G. Where required, fire-retardant treatment for lumber shall conform to the requirements of the indicated code.

2.05 PLYWOOD AND HARDBOARD

A. Plywood shall conform to the requirements of U.S. Product Standard PS-1. Plywood panels shall be marked with grade mark of the American Plywood Association. The mark shall identify the plywood as to species, glue type, and grade and shall comply with the applicable commercial standards. Except as otherwise indicated, plywood shall be Douglas Fir, Structural 1. Plywood for other specific applications shall comply with the following:

1. Plywood for use in concrete forms shall conform to the requirements of Section 03 30 00.

2. Plywood siding shall be exterior type.

B. Hardboard shall be temper-treated panels manufactured from interfelted lignocellulose fibers consolidated under heat and pressure in a hot press to produce a smooth, hard surfaced material that is resistant to water and stains. Hardboard shall conform to the requirements of PS-58.

2.06 ROUGH HARDWARE

A. The term "rough hardware" includes nails, screws, lag screws, bolts, nuts, washers, plates, metal fasteners, framing anchors, anchor bolts which are to be embedded into concrete, concrete masonry, or brick masonry, and similar items employed in erection and construction of the rough carpentry work. Rough hardware shall be of standard manufacture and shall be approved by a recognized agency for the intended applications. Unless otherwise indicated, hardware items shall be steel, hot-dip galvanized after fabrication and shall comply with Section 05 50 00.

B. Anchors and fasteners for securing wood items, unless otherwise indicated, shall comply with the following:
1. Bolts, nuts, and studs shall conform to the requirements of Federal Specifications FF-B-584E (1), FF-N-836D (1), FF-S-1362, and FF-B-575C, and Section 05 50 00.

2. Nails and staples shall conform to Federal Specification FF-N-105B (3) Int. Amd. 4 and shall be the type and size best suited for the intended application. Nails shall be galvanized steel, aluminum, or stainless steel, as appropriate, where exposed to weather. Nails used for fastening plywood to nailers on steel beams shall be short nails of wire gauge as indicated. Nails used for exterior exposed to view plywood siding, siding, or trim shall be stainless steel.

3. Wood screws shall conform to the requirements of Federal Specification FF-S-111D for the style and material indicated. Wood screws shall be galvanized where exposed to view or to weather.

4. Lag screws or lag bolts shall conform to the requirements of Federal Specification FF-B-561C for the type and grade best suited for the purpose. Lag screws or lag bolts shall be galvanized where exposed to view or weather.

5. Toggle bolts shall conform to the requirements of Federal Specification FF-B-588C (1) for the type and grade best suited for the purpose.

C. Metal framing devices shall be joist hangers, header hangers, framing anchors, post anchors, and structural framing connectors fabricated from steel and hot-dip galvanized after fabrication. The framing devices shall be equal or superior to indicated requirements for design, friction, and loading. Framing devices shall include properly sized nails, bolts, lag bolts, or other fasteners required by design calculations for the framing.

D. Plates and sills shall be Douglas fir, pressure treated with a water-borne preservative complying with the requirements of AWPA Standard P5 and AWPA C1.

E. Plyclips shall be extruded aluminum clips manufactured from 6063-T6 aluminum alloy and designed and sized for intended use.

2.07 MISCELLANEOUS PRODUCTS

A. Building paper or felt shall be non-perforated, asphalt-saturated organic felt conforming to ASTM D 226, 15 lb/100 sq ft.

B. Termite shields shall be not less than 26-gauge, zinc-coated steel or 30-gauge, terne steel coated with 40 lb of coating material per 100 square feet.
C. Insulation material shall be fiber glass type, R30.

2.08 MANUFACTURERS

A. Products of the type indicated shall be manufactured by one of the following or equivalent:

1. Preservatives:
   - Zehrung "Pentaseal"
   - Sherwin Williams, "Kemwood Penta"

2. Metal Framing Devices:
   - Simpson Strong-Tie Co.

3. Insulation:
   - Owens Corning

PART 3 - EXECUTION

3.01 GENERAL

A. Verify dimensions and condition of related components in field as required.

B. The work shall include rough hardware, not otherwise indicated, and which is necessary for proper framing, including nails, spikes, dowels, fasteners, framing devices, and similar items.

C. The work shall include metal framing devices as shown on the drawings and as required to provide a complete stable, secured, and firm framing system meeting applicable codes.

D. Framing members and assemblies shall be closely fitted, accurately set, and rigidly secured to required lines, levels, and arrangements indicated. Framing shall be accurately and neatly cut and shall be securely nailed, spiked, or otherwise fastened in place in a workmanlike manner. Timber connectors and installation shall conform to requirements of AITC 104 and AITC 105.

3.02 FASTENERS AND FRAMING DEVICES

A. Except as otherwise indicated, nails shall not be driven closer together than 1/2 their length unless driven in drilled holes, nor driven closer to the edge of a member than 1/4 of their length. When necessary to prevent splitting, holes
shall be drilled slightly smaller than nail diameters. Common nails shall be used unless otherwise indicated.

B. Malleable or cut-steel washers shall be provided under bolt heads and nuts, except where bearing on steel plates or other steel attachments or where flat-head countersunk bolts are shown. Bolt holes shall be drilled 1/32 inch to 1/16 inch larger diameter than the bolts they are to accommodate and shall be bored true-to-line. Members shall be clamped together, bolts shall be secured in place, and nuts shall be drawn up tightly. Bolts shall be tightened again immediately prior to enclosing with finish or, if left exposed, upon completion of other work. Holes at anchor bolts embedded in concrete may be 1/16-inch larger than bolt diameter.

C. Holes to receive lag screws shall be bored first of the same diameter and depth as shank, then continued to depth equal to length of screw with diameter equal to the base of the screw thread. Screws shall penetrate into the farther member a distance equal to at least 7 times the diameter of the screw shank. Washers shall be installed under each lag screw head bearing on wood.

D. Metal framing devices shall be installed where shown and required. Nails for the framing devices shall be furnished or recommended by the manufacturer of the anchor device. Nails shall be driven to full depth at all holes in anchors. Bolt and lag fasteners shall be drawn tight.

3.03 FRAMING

A. Structural wood framing members shall not be spliced between bearing points or supports. Due care shall be exercised in placing framing so that structural and other important members do not require cutting for openings, pipes, vents, conduits, or ducts. Bearing surfaces on which wood structural members are to rest shall be finished to give full, true, and even support. Wedges or shims shall not be used to correct faulty work. Wood members that have been split or otherwise damaged shall be removed and replaced.

B. Skilled workers shall be used for all cutting and framing of wood members required to accommodate structural members, routing of piping, conduit, ducts, and the installation of mechanical, electrical, or other apparatus or equipment. Members shall not be cut, notched, or bored more than 1/4 of their depth without proper reinforcing.

C. Bottom plates and sill plates that are secured to concrete shall be located as indicated. The anchor bolts shall be located as indicated or as required. The plates and sills shall be leveled with shims. Washers shall be installed and nuts shall be tightened to level bearing, after which the space (1/2-inch minimum) between the sill and concrete shall be dry packed with cement grout complying with Section 03 30 00.
D. Studs shall be installed at a spacing of 16 inches on centers unless otherwise indicated. A single plate shall be provided at the bottom and a double plate at the top of wall framing unless otherwise shown. Joints in upper and lower members of the top plate shall be staggered not less than 4 feet. Stud walls and partitions shall have a continuous row of blocking or firestopping that shall form a complete and effective separation for the entire width of the wall or partition. Blocking shall be located so that there will be no concealed air spaces greater than 7 feet in horizontal or vertical dimension. Defective materials including crooked, warped, or bowed materials shall be replaced.

E. Except as otherwise indicated, blocking and backing in walls and ceilings shall be nominal 2-inch thick material of a depth as needed and shall be accurately located around light fixtures, ceiling registers, grilles, plumbing fixtures, and other mechanical and electrical items wherever required. Blocking shall fit snugly and shall be spiked into the supporting framing members. Wood blocking (backing) to receive sheathing, siding, metal lath, and gypsum board shall be installed wherever necessary for securing the facing materials.

F. Backing (blocking) shall be accurately located and installed for all building specialties, toilet accessories, and finish hardware items.

G. Where indicated, nominal 2-inch thick nailing blocks (dovetail type) shall be installed in concrete to receive superimposed wood stripping, grounds, and backing. Applied grounds or stripping shall be securely nailed into wood nailing blocks.

H. Furring shall be 2-inch by 3-inch wood studs spaced at 16 inches on center, laid flat to the wall.

I. Rafters and joists shall be placed crown up and supported firmly on the framing below. Care shall be used in selection and placing of members. Positive and secure attachment shall be provided. Double joists and double headers shall be provided to receive trimmers at openings that cut or interrupt normal rafter spacing.

J. Roofs shall be sloped as indicated.

K. Plywood siding shall be applied in accordance with the manufacturer's published recommendations and the American Plywood Association standards.

L. Plywood sheathing shall be installed with face grain across supports and end joints shall be over joists and shall be staggered. Blocking shall be provided at all unsupported edges.

M. Fire stops shall be not less than 2-inch nominal thickness and of the same width as the studs. Strips of full-thickness fiberglass or rock wool shall be
installed around pipes, ducts, conduits, and other penetrations through fire stops.

N. Locations and sizes of sleepers for mechanical equipment and curb openings shall be verified prior to installation. Sleepers shall be ripped to conform to roof slope if necessary.

O. Members required to be sandblasted shall be lightly sandblasted.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and install Class A built-up roofing system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

1.02 RELATED WORK

A. Flashing and Sheet Metal are included in Section 07 60 00.

B. Skylights are included in Section 07 81 30.

1.03 CODES

A. The work of this Section shall comply with the current editions of the following codes:

1. California Building Code

1.04 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the work of this Section:

1. Federal Specifications:
   SS-C-153 Cement, Bituminous, Plastic

2. Commercial Standards:

   ASTM D41 Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing

   ASTM D226 Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

   ASTM D312 Standard Specification for Asphalt Used in Roofing
ASTM D1668  Standard Specification for Glass Fabrics (Woven and Treated) for Roofing and Waterproofing


ASTM D2178  Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing

ASTM D2626  Standard Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing

ASTM D6380  Standard Specification for Asphalt Roll Roofing (Organic Felt)

FM  Factory Mutual

UL  Underwriters Laboratories, Inc.

3. Trade Standards:

   NRCA  National Roofing Contractors Association

1.05 SUBMITTALS

A. The following shall be submitted in compliance with Section 01 32 19:

1. The manufacturer's specifications, literature, technical data, and published installation instructions for each major roofing element, product or system.

2. Cap sheet color charts for selection of color by the City. All standard and special colors shall be made available for selection and installation at no additional cost to the City. Submit two product samples in color selected by the City.

1.06 OWNER'S MANUAL

A. The following shall be included in the Owner's Manual in compliance with Section 01 32 19:

1. After installation of the roofing, the Contractor shall furnish a signed affidavit that the roof complies with the requirements of these Specifications and the manufacturer's recommendations for the class and type of roof indicated.

2. The roof contractor shall furnish duplicate signed copies of roof manufacturer's written guarantee.
1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Manufactured materials shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.

B. All materials shall be carefully stored in a dry location and in a manner that will prevent damage of the products and in an area that is protected from deleterious elements.

C. If materials are stored outside, they must be elevated on a platform and protected with a waterproof cover which will shed water away from the material.

D. Store all products in an upright position. Do not double stack unless product is on pallets and packaged as received from factory. Acceptability of double stacking must be indicated on product packaging. Do not double stack modified bitumen membranes.

E. Store adhesives and primers between 50°F and 100°F, or restore to temperature range prior to use.

F. Do not store modified bitumen membranes at ambient temperatures above 120°F.

1.08 GUARANTEE

The Contractor shall furnish duplicate signed copies of roof manufacturer's written guarantee countersigned by the Contractor. The guarantee shall be a 20-year guarantee from date of final acceptance of the project agreeing to repair or replace work which leaks water, deteriorates or otherwise fails (due to failures of materials or workmanship) to perform as roofing and provide a waterproof, watertight roofing system.

PART 2 - PRODUCTS

2.01 GENERAL

A. The roofing products shall be in accordance with the manufacturer's literature and published specifications for the indicated products.

B. Materials and roofing systems shall be provided which have been tested, listed and labeled by UL for the specified Class or Rating of roofing. Bitumen and felts shall be the products of the same manufacturer, and all other materials used within the system shall be acceptable to the approved manufacturer.
C. The built-up roofing and base system shall be not less than a designed system that may be bondable for 20 years and that is rated as a UL Class A built-up system.

D. Roof aggregate color samples shall be submitted for selection by the City.

2.02 ROOFING MATERIALS

A. Asphaltic materials for built-up roof shall conform to the following requirements:

1. Low melt asphalt for dead level application on roofs with a maximum pitch of 1/4 inch per foot shall conform to ASTM D312, Type I.

2. Medium melt asphalt for flat application on roofs with a maximum pitch of 1 inch per foot shall conform to ASTM D312, Type II.

3. High melt asphalt for steep application on roofs with a maximum pitch of 3 inches per foot shall conform to ASTM D312, Type III.

4. Special asphalt for very steep application on roofs, walls or parapets with a pitch over 3 inches per foot shall conform to ASTM D312, Type IV.


B. Felts for built-up roof construction shall conform to the following:

1. Asphalt saturated organic felt shall conform to ASTM D226, Type II.

2. Base flashing felts shall be a durable, flexible, reinforced modified bitumen roof flashing that incorporates flexible polyester mats with a fiberglass core (mat) and high quality asphalt. The product shall be provided with a colored ceramic or mineral top surface for ultraviolet light protection. Base flashing felt shall be a fire resistant product. Color shall be selected by the City from manufacturer's standard colors.

   Base flashing shall be Flintlastic STA as manufactured by CertainTeed, Commercial Roofing Systems.

3. Asphalt impregnated inorganic glass fiber felt shall conform to ASTM D2178, Type III.

C. Base sheet shall conform to ASTM D4601, Type II.
D. Mineral-surfaced cap sheets shall conform to ASTM D3909. Color shall as selected by the City. All standard and special colors shall be made available for installation at no additional cost to the City.

E. Woven glass fabric for reinforcing shall conform to ASTM D1668.

F. Plastic cement shall conform to ASTM D2822, Type I.

G. Flashing cement shall be compatible with asphaltic roofing system.

H. Mechanical fasteners shall be approved by roofing and insulation manufacturers for application of the first ply into insulation and/or as required to meet the FM windstorm classification criteria.

I. Roof walkways shall be 1/2-inch thick, 24-inch minimum width homogeneous material consisting of a core of asphalt, plasticizers, and inert fillers bonded by heat and pressure between 2 saturated and coated sheets of fiberglass membrane or organic felt. The top sheet shall be weather-coated with embedded ceramic or mineral granules.

J. Tapered edge strips and cant strips shall be asphaltic impregnated fiber strips.

2.03 ROOFING SYSTEM PRODUCTS

A. Built-up, inorganic, glass-felt roofing system for decks with inclines of zero to 4 inches in 12 inches shall be the following products, or equals:

1. Nailable decks (wood or lightweight insulating concrete deck surface) shall be roofed with the following roofing system GTA-FR-N-B3 as manufactured by CertainTeed or approved equivalent.

<table>
<thead>
<tr>
<th>Product</th>
<th>Number of Plies or Coats</th>
<th>Minimum Weight in lb/100 sf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheathing Paper (Mfg. Standard)</td>
<td>1</td>
<td>@ wood decks only</td>
</tr>
<tr>
<td>Base sheet, Flexiglas FR</td>
<td>2</td>
<td>60 lbs @30 lb each</td>
</tr>
<tr>
<td>Inter Ply Sheet, Flintlastic STA</td>
<td>1</td>
<td>90 lbs</td>
</tr>
<tr>
<td>Modified bitumen with mineral top surface, Flintastic GTA-FR Cap Sheet</td>
<td>1</td>
<td>105 lbs</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>255 lbs min</td>
</tr>
</tbody>
</table>
2.04 MANUFACTURERS

Base flashing systems of the type indicated and suitable for purpose shall be as manufactured by CertainTeed, Johns Manville, or approved equivalent.

PART 3 - EXECUTION

3.01 GENERAL

A. The roofing work shall be performed by an installer authorized by the roofing system manufacturer. All work to be performed in accordance with the material manufacturers’ published specifications.

B. The Contractor shall investigate the substrate and the conditions under which roofing work is to be performed and shall notify the City in writing of unsatisfactory conditions. The work shall not proceed until such unsatisfactory conditions have been corrected.

C. Environmental Requirements:

1. Installation of roof system shall not be performed during wet conditions.

2. Modified bitumen membrane shall not be installed in extremely cold temperatures unless precautions have been taken to protect the rolls from freezing.

3. Correct solvent, heat welding, adhesive, and/or bitumen application temperatures must be maintained.

4. Verify adhesion regularly during application. Hot-applied bituminous roofing materials must be applied promptly. “Brooming” directly behind organic felt application is recommended to achieve optimum ply embedment.

5. Asphalt mopping shall not be done at consistent temperatures below 40°F.

6. All materials to be installed must be kept dry.

D. Protection:

1. Contractor and contractor’s crewmembers shall observe and enforce all appropriate safety and fire department regulations during installation and handling of roofing materials and asphalts.
2. A fully operational fire extinguisher shall be maintained within reasonable access to each applicator, at propane tanks, and in the kettle area, and/or as required by local fire department regulations.

3. All materials used in the construction of the roof system are to be protected from site damage during application. Traffic areas which serve as walkways are to be protected to prevent damage to the roofing membrane.

4. Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.

5. Designate one trained person on each crew to perform a daily fire watch. The designated crewmember shall watch for fires or smoldering materials on all areas of roof construction. Continue the fire watch for 4 hours after roofing material application has been suspended for the day.

6. Prevent access by the public to materials, tools and equipment during the course of the project.

7. Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.

3.02 CANT AND EDGE STRIPS

Cant strips and tapered edge strips shall be provided at all intersections of roof surfaces with vertical walls, parapets, curbs, and accessories that do not have built-in cants and shall be miter cut at corners. Cant strips and tapered edge strips shall be firmly attached in place prior to roof application.

3.03 WALKWAYS

Roof walkways shall be installed in dabs of flashing compound. Roof walkways shall be installed per roofing and walkway manufacturer’s written instructions with a 6-inch space between walkway pads for drainage. The joint lines shall remain straight and true while the pads are embedded firmly into the dabs of flashing compound.

3.04 APPLICATION OF BITUMEN

The final coat of bitumen shall be applied on an area as rapidly as practicable. Incomplete roofing shall be protected from dampness by a glaze of bitumen when final coating is delayed.
3.05 EDGES AND PENETRATIONS

At penetrations and edges of the roof not contained by a wall, an additional lower-ply extension of base sheet folded back over top ply to form an envelope shall be provided by the Contractor.

3.06 FASTENING

Spot mopping, nailing, or mechanical attachment shall be not less than the most stringent requirement of the manufacturer, codes and Factory Mutual's "Wind Uplift Requirement.” The most stringent attachment requirement shall govern and be followed in installation of the base sheet. The asphalt mopping installation of the roof insulation shall be as required by the roofing and insulation manufacturers. The most stringent requirement for installation of the roof insulation shall govern. The Contractor shall obtain written acceptance of the agreed upon insulation system from the product manufacturers.

3.07 EMBEDMENTS

All sheet metal and other items embedded into the roofing shall be prime coated not less than 24 hours prior to installation unless otherwise instructed and approved by the manufacturer and the City in writing.

END OF SECTION
SECTION 07 60 00
FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform all sheet metal work and appurtenant work, complete as shown on the drawings, as specified herein, and as required to complete the work and provide weather-tight structures and penetrations.

B. The principal items of sheet metal work shall include sheet metal flashings, collars, equipment supports at all roof penetrations, metal wall flashing and expansion joints, downspouts, gutters, and miscellaneous sheet metal accessories.

1.02 RELATED WORK

A. Sealants and Caulking are included in Section 07 92 00.

B. Architectural Painting is included in Section 09 90 00.

1.03 CODES

A. The work of this Section shall comply with the current editions of the following codes:

1. California Building Code
2. California Mechanical Code
3. California Plumbing Code
4. Uniform Building Code

1.04 REFERENCE STANDARDS

A. Federal Specifications:

1. QQ-T-201 Terneplate, for Roofing and Roofing Products
2. TT-P-641 Primer Coating, Zinc Dust-Zinc Oxide (for Galvanized Surfaces)
3. UU-B-790 Building Paper, Vegetable Fiber (Waterproofed, Water Repellent and Fire Resistant)
B. Commercial Standards:

1. ASTM A240  
   Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

2. ASTM A525  
   Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

3. ASTM A526  
   Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality

4. ASTM B32  
   Standard Specification for Solder Metal

5. ASTM B209  
   Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

6. ASTM D1187  
   Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal

C. Trade Standards:


2. The Aluminum Association "Specifications for Aluminum Sheet Metal Work in Building Construction"

3. American Welding Society (AWS)

1.05 SUBMITTALS

A. The following shall be submitted in compliance with Section 01 32 19:

1. Color samples for color selection by the City and product samples when requested by the City for examination.

2. Shop drawings showing materials, gauges, finishes, layout, jointing, profiles, fabrication of special shapes, fasteners, and methods of attachment to adjacent construction.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials: Manufactured products shall be delivered in original, unbroken packages, containers or bundles bearing the name of the manufacturer in a manner that will prevent damage to the products.

B. Storage: Products shall be carefully stored in a protected area that will prevent damage or marring of the products and their finishes.

1.07 QUALITY ASSURANCE

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

B. In addition to complying with pertinent codes and regulations, comply with pertinent recommendations contained in current edition of "Architectural Sheet Metal Manual" published by the Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

C. Standard commercial items may be used for flashing, trim, reglets, and similar purposes provided such items meet or exceed the quality standards specified.

PART 2 - PRODUCTS

2.01 GENERAL

A. Sheet metal shall be galvanized steel unless otherwise indicated. Sheet metal work in connection with roofing shall be in accordance with roofing manufacturer's published recommendations and specifications.

B. All sheet metal flashings necessary to make building weather-tight shall be provided, whether or not indicated at no additional cost to the City.

2.02 ALUMINUM PRODUCTS

Reglets shall be extruded aluminum with protective coating, of type and profile indicated (or as required), compatible with flashing, and non-corrosive.

2.03 FERROUS METALS

Zinc-Coated Steel: Zinc-coated steel shall be commercial quality with 0.20 percent copper, ASTM A525 except ASTM A527 for lock-forming, G90 hot-dip galvanized, mill phosphatized where indicated for painting; 0.0359-inch thick (20-gauge) except as otherwise indicated.
2.04 LEAD ALLOY AND SOLDERING MATERIALS

A. Lead alloy shall be 4 to 6 percent antimony and the remainder shall be lead. Lead sheet shall be soft temper, except hard temper for flanges. Weight shall be not less than 4 lb/sq ft unless otherwise indicated.

B. Solder shall conform to ASTM B32 Alloy Sn50, 50 percent tin, 50 percent lead.

C. Soldering flux shall not be injurious to metal surfaces being treated.

2.05 FASTENERS

A. Fastening devices shall be of the same material as the sheet metal being used or corrosion-resistant metal compatible with sheet metal being used. Fasteners exposed to the weather shall have neoprene washers. Washers shall be 0.04-inch minimum thickness. A rubber-type washer shall be used beneath metal washer or fastener head where weather tightness is required.

B. Use only applicable iron rivets having rust-resistant coating, galvanized nails, and cadmium-plated screws and washers in connection with galvanized iron and steel.

2.06 PLASTIC CEMENT

Plastic cement shall conform to ASTM D2822.

2.07 SEALING MATERIALS

A. Sealants shall be as indicated under Section 07 92 00. Colors shall be matching to the surrounding exposed material as approved by the City.

B. Sealer tape shall be polyisobutylene sealer tape specifically formulated for setting flanges on bituminous roofing.

2.08 COATING MATERIALS

A. Primer coat for galvanized steel shall conform to Federal Specification TT-P-641G(1) Type II.

B. Asphaltic coating compound shall conform to ASTM D1187.

2.09 BUILDING PAPER OR FELT

A. Building paper shall conform to ASTM D4869. Building paper shall be Kraft waterproof building paper or approved equivalent.

B. Asphalt or coal tar-saturated felt shall conform to ASTM D226.
2.10 OTHER MATERIALS

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

2.11 SHOP FABRICATION REQUIREMENTS

A. The work shall be shop-fabricated to greatest extent possible. Fabricator shall comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Work shall be fabricated for waterproof and weather-resistant performance with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the Work. The Work shall be formed to fit substrates. Comply with material manufacturer's instructions and recommendations for forming material. Exposed sheet metal work shall be formed without excessive oilcanning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

B. Seams: Non-moving seams in sheet metal shall be fabricated with flat-lock seams. For metal other than aluminum, tin the edges, form the seams, and solder them. Aluminum seams shall be formed with epoxy seam sealer and joints shall be riveted for additional strength where required.

C. Expansion Provisions: Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently water/weatherproof, expansion joints shall be formed of intermeshing hooked flanges not less than 1 inch deep, filled with mastic sealant within joints.

D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance, metal shall be formed to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

E. Separations: Separation shall be provided of metal from non-compatible metal or corrosive substrate by coating concealed surfaces at locations of contact with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

F. Gutters and downspouts shall be of sizes as shown on the Drawings and with wire basket type strainers of 14-gauge stainless steel wire or cast bronze.

G. All aluminum shall be welded unless otherwise indicated. Welding shall conform to the standards of the Aluminum Association and ASMM.

H. Galvanized steel corner joints shall be soldered. Unless indicated otherwise, other joints shall be as required by the Reference Standards.
I. All work and finishes shall be protected from scratches and abrasions.

J. All flashings, reglets and counter-flashing and associated flashings shall be fabricated by the same manufacturer and be installed as a complete flashing system. All flashings shall be creased longitudinally or otherwise formed with sufficient spring action to hold the bottom edges firmly against the base flashing or similar material.

K. Intersecting corners of copings shall be accurately fitted and welded. Corners may be shop-assembled, manufactured, or extruded units. Coping shall be in accordance with ASMM Plate 68 except modified as indicated, with Alternate 5 seams that allow for 1/4-inch expansion per each 10 feet of length.

L. Access doors shall be provided as required or as indicated. Sizes and locations shall be as required by governing authorities, codes, and as indicated. Key-locked access doors shall be provided where indicated.

2.12 FABRICATED SHEET METAL WORK

A. Stamped sheet metal vents or louver-type vents (where indicated) shall be designed to provide watertight flush corners and shall be of size indicated. Each vent shall be equipped with 1/4-inch square galvanized or aluminum mesh hardware cloth insect screen. Stamped metal items shall be made of coated aluminum or galvanized sheet metal.

B. Unless otherwise shown, downspouts with conductor head 1/2 inch below gutter or scupper and hangers shall be designed similar to ASMM Plates 32 Fig. B and G, 25 Fig. C, and 35, Figure E, H or I. Connector shall be per Plate 33 Fig. B, Details 1 and 2 with funnel Fig. E (if possible) and with the joint between gutter and outlet welded or soldered.

C. Downspout shall be constructed of 18 gauge galvanized steel and shall have all joints welded or soldered except the joint between the gutter outlet pipe and downspout. Gutter and gutter outlet pipe shall be fabricated from 18 gauge galvanized steel. Expansion joints shall be spaced not more than 34-feet on centers or as indicated. All joints shall be welded.

D. All corners of vent screeds, reglets, and trim shall be mitered.

E. Access doors shall be of the types necessary to suit conditions and shall be provided where necessary.

F. Pitch pockets and equipment coping and support flashings shall conform to the reference standards and shall be provided where necessary.
G. Sheet metal items at roof penetrations shall be provided and coordinated with the roofing system. The design and details shall conform to the standards unless otherwise indicated.

H. Flashing shall be provided at all roof penetrations.

2.13 MANUFACTURERS

A. Products shall be of the following manufacture and model number or approved equal:

1. Reglets: Superior Concrete Accessories; Morrison and Company "Cushion-Lock;" Fry Reglet Corp.


PART 3 - EXECUTION

3.01 GENERAL

A. Except as otherwise indicated, installer shall comply with manufacturer's installation instructions and recommendations and with SMACNA "Architectural Sheet Metal Manual." Units of work shall be anchored securely in place by methods indicated, providing for thermal expansion of metal units, fasteners shall be concealed where possible, and units set true to line and level as indicated. Work shall be installed with laps, joints and seams that will be permanently watertight and weatherproof.

B. The Contractor shall coordinate the flashings and sheet metal work required with the different trades to make sure all items that penetrate the roof are provided with all necessary sheet metal products. Sheet metal shop manufactured curbs, equipment supports, and equipment platforms shall be provided as required.

C. All work shall conform to trade standards. Flashings shall be coordinated with roofing work. Sheet metal and roofing shall provide a weather-tight and watertight assembly.
D. Sheet metal shall be accurately formed to the dimensions and shapes indicated. Work shall be fitted snugly, with straight, true lines with exposed faces aligned in proper plane, free from waves and buckles. Arrises and angles shall have true and sharp lines, and surfaces shall be free from waves and buckles. All exposed edges shall be hemmed. Holes for fasteners within sheet metal work exposed to temperature changes shall be elongated holes for material expansion and movement.

E. All sheet metal work shall be furnished complete with supports, hangers, bracing, clamps, anchors, and other devices as required for reinforcement and proper attachment to adjacent construction. Fastenings shall be concealed wherever possible. Joints, fastenings, reinforcements, and supports shall be sized and located as required to preclude distortion or displacement due to thermal expansion and contraction.

F. All surfaces upon which sheet metal is to be placed shall be dry, smooth, even, and free of any projections and hollows. Sheet metal shall be laid with all joints true and even and firmly attached with all fastener heads flush with the top surface.

G. The underlayment shall be overlapped at least 2 inches to shed water and shall be secured along the lapped edges. Aluminum or stainless steel fasteners shall be used with aluminum sheet metal.

H. Dissimilar materials shall be isolated with 2 coats of asphaltic paint, asphaltic coating compound, or sealer tape. Only stainless steel fasteners shall be used to connect isolated dissimilar metals.

I. Joints shall be sized and spaced to permit sheet movement for thermal expansion and contraction of 1/4-inch per 10-foot length, on 100 degree F temperature difference.

J. Roofing sheet metal items shall be built into the roofing in strict accordance with directions of roofing manufacturer.

3.02 INSTALLATION

A. Gutters shall be provided to the indicated cross-section, complete with shop-fabricated corners, outlet (nipple) sections, joining plates, concealed hangers and downspouts with standoff brackets.

B. Gutters shall be provided with baffle-type expansion joints with expansion caps over 1 1/2-inch baffle flanges at 40-foot centers. A 1-inch gap between the baffles shall be allowed.

C. Flashings at vertical surfaces shall be installed at intersections of the roof with vertical surfaces and at projections through the roof. Corner units shall be
factory-fabricated, shall have mitered soldered or welded corner joints, and shall be installed with 3-inch (minimum) lap joint over flashings on each side.

D. Gravel stops and copings shall have joints at 10-foot (max) spacing and at 2 1/2 feet from corners. Joints shall be butted with 3/16-inch space centered over matching 8-inch long backing plate with sealer tape in laps. Corner units shall be welded units. All joints shall be provided with cover plates.

E. Flanges of sheet metal items shall be set on continuous sealer tape on the top edge envelope ply of roofing. Flanges shall be nailed through sealer tape at 3-inch (max) spacing or otherwise securely fastened in an approved manner.

3.03 SOLDERING

A. General:

1. Thoroughly clean and tin the joint materials prior to soldering.

2. Perform soldering slowly, with a well heated copper, in order to heat the seams thoroughly and to completely fill them with solder.

3. Perform soldering with a heavy soldering copper of blunt design, properly tinned for use.

4. Make exposed soldering on finished surfaces neat, full flowing, and smooth.

B. After soldering, thoroughly wash acid flux with a soda solution.

3.04 CLEANING AND PROTECTION

Exposed metal surfaces shall be cleaned, removing substances that might cause corrosion of metal or deterioration of finishes.

3.05 TESTS

Upon request of the City, demonstrate by hose or standing water that the completed flashing and sheet metal work is completely watertight.

END OF SECTION
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PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and install special skylights where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

1.02 RELATED WORK

A. Built-Up Roofing System is included in Section 07 51 00.

B. Flashing and Sheet Metal are included in Section 07 60 00.

1.03 CODES

A. The work of this Section shall comply with the current editions of the following code:

1. California Building Code

2. Cal-OSHA 29 CFR 1910.23 (a)(4) and 1910.23 (e)(8)

1.04 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the work of this Section:

1. Commercial Standards:

   NRCA    National Roofing Contractors Association

1.05 SUBMITTALS

A. The following shall be submitted to the Engineer in compliance with Section 01300.

   1. Manufacturers’ specifications, literature and published installation instructions for each type of skylight.
2. Shop Drawings showing the materials, gauges, sizes, finishes, profiles, fabrication of special shapes, fasteners, and method of attachment to adjacent construction.

3. Color chart for selection by the City.

4. Stainless steel screen guard material and layout data.

5. Copy of the warranty proposed to be issued on the work of this Section.

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01 65 00.

B. Manufactured products shall be delivered in original, unbroken packages or containers bearing the name of the manufacturer.

C. All products shall be carefully stored on wood blocking in accordance with manufacturer’s instructions in an area that is protected from deleterious elements. Storage shall be in a manner that will prevent damage or marring of finish.

### 1.07 APPROVAL

Skylights shall have approval of ICBO Report #1998 and California State Fire Marshal.

### PART 2 - PRODUCTS

### 2.01 SKYLIGHTS

A. Skylights shall be installed at locations and of sizes as shown on the Drawings, in accordance with the manufacturer’s published literature and specifications, and as specified herein.

B. Design: Skylights shall be factory-assembled of the double-dome type designed to meet applicable code requirements. Skylights shall be weathertight. The skylight unit shall be designed to accommodate a temperature change of 100° F without distress in assembly, fasteners, or glazing.

C. Frames and Gaskets: Skylights shall include a 6063-T5 extruded aluminum curb frame with an integral sloping gutter and dome elevating leg with continuous vinyl or neoprene support gasket and retaining frame. The prefabricated curb for fixed skylights shall be of aluminum construction, insulated with fiberglass, and 9 inches in height. Unless otherwise directed,
design to a maximum deflection of L/180. Make necessary allowances for expansion and contraction. Provide weep holes to drain condensation.

D. Finishes: Frame shall be provided with baked enamel coating. Color shall be as selected by City.

E. Domes: Outer dome for fixed skylights shall be formed of one-piece bronze transparent cast acrylic to withstand a minimum live load of 40 pounds per square foot.

F. Inner dome shall be formed of one-piece bronze transparent cast acrylic.

G. Provide flashings of all types required in connection with the work of this Section, finishing exposed surfaces to match the finish of adjacent materials. Finish all exposed fasteners to match the finish of adjacent materials. Isolate dissimilar metals with zinc-chromate primer or heavy-bodied bituminous paint.

H. Skylights shall be as manufactured by Lane-Aire or approved equivalent.

2.02 SKYLIGHT SCREEN GUARD

A. Each skylight shall have stainless steel screen guard.

B. Screen guard shall be curb mounted on top of the skylight.

C. Screen guard shall meet Cal-OSHA General Industry Standard 29 CFR 1910.23 (a)(4) and 29 CFR 1910.23 (e)(8), including 400 lbs. load design requirements.

D. Screen guard shall be Model STS as supplied by Simplified Safety or approved equal.

2.03 FABRICATION

Fabricate in strict accordance with the approved Shop Drawings and in the shop to the maximum extent practicable.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions have been corrected.
3.02 INSTALLATION

A. The installation shall conform to applicable codes and the manufacturer’s published recommendations, specifications, and installation instructions for the type of work being performed. The construction shall be coordinated with the work of other trades.

B. The Contractor shall verify the opening sizes required for the skylights prior to structural framing; shall notify the City of conflicts and seek direction; and shall make modifications to the structural framing or skylight details as necessary.

C. Cant strips and tapered edge strips shall be provided at all intersections of roof surfaces with curbs and accessories that do not have built-in cants.

D. All sheet metal surfaces to be embedded into roofing shall be cleaned and prime-coated with asphalt primer prior to embedding into roofing system.

E. Dissimilar metals shall be properly isolated with protective coating or isolation material.

F. Thermal movement up to 100°F change shall be accommodated without distress in assembly of fasteners.

G. Upon completion of the installation, touch up scratches and abrasions on finished surfaces to be completely invisible to the unaided eye from a distance of five feet.

END OF SECTION
SECTION 07 90 00
WATERPROOFING

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and install waterproofing and moistureproofing of underground vaults (fully or partially buried), buildings, concrete and masonry retaining walls, and manhole concrete surfaces as specified herein.

1.02 RELATED WORK

A. Concrete Work is included in Section 03 30 00.

B. Reinforce Concrete Block Masonry is included in Section 04 22 00.

C. Sealants and Caulking are included in Section 07 92 00.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course

2. ASTM D41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing


1.04 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01 32 19:

1. Manufacturer's product data including catalogue cuts

2. Manufacturer's installation instructions
1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.

B. Storage: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from moisture, direct sunlight, extreme heat and freezing temperatures.

PART 2 - PRODUCTS

2.01 GENERAL

A. Only products certified as complying with the indicated requirements shall be provided.

B. Products shall be new, of current manufacture, and shall be the products of reputable manufacturers with 5 years of experience in the manufacture of such products.

C. Products shall be recommended by the manufacturer for the application indicated.

2.02 WATERPROOFING COATINGS

A. General: One of the two alternate waterproofing coatings/systems as specified below shall be used as shown on the Drawings or if not shown, as required herein. Waterproofing coatings/systems shall be applied to surfaces as specified in 3.01.B.

B. Cold-Applied Elastomeric Waterproofing Membrane System:

1. Cold-applied elastomeric waterproofing membrane system, if used, shall be applied only on the exterior buried concrete and masonry surfaces. The system shall include bitumen-modified polyurethane elastomeric waterproofing membrane, reinforcing fabric, and a protection board to protect the waterproofing membrane. All components of the waterproofing system shall be manufactured by a single manufacturer.

2. Cold-applied bitumen-modified polyurethane elastomeric waterproof membrane shall be HLM 5000 as manufactured by Sonneborn or an approved equivalent.

3. Reinforcing fabric shall be Sonoshield Reinforcing Fabric as manufactured by Sonneborn or an approved equivalent.
4. Protection board shall be ¼” thick sheets, as manufactured by Sonneborn or an approved equivalent.

5. The waterproofing system shall be designed to withstand a minimum 20-foot hydrostatic head.

C. Capillary Waterproofing Coating:

1. Capillary waterproofing coating, if used, may be applied on exterior and/or interior buried concrete and masonry surfaces.

2. Capillary waterproofing coating shall be Permaquik Super 200, manufactured by American Permaquik Inc. or an approved equal, applied as a slurry coat to create a waterproofing barrier through the thickness of the wall.

3. Color of Permaquik Super 200 to be applied on exterior and interior surfaces shall be gray and white, respectively.

2.03 MOISTUREPROOFING COATING

A. Moistureproofing coating on exterior buried concrete and masonry surfaces shall be asphalt-based emulsion product. The moistureproofing coating shall be 2-coat system of Hydrocide 700B as manufactured by Sonneborn, Permaquik 150 as manufactured by American Permaquik Inc. or an approved equivalent.

B. Moistureproofing coating shall be applied to surfaces as specified in 3.01.D.

PART 3 - EXECUTION

3.01 GENERAL

A. Products shall be installed in accordance with the manufacturer's installation instructions.

B. Waterproofing coating shall be applied to all exterior surfaces of underground vaults, manholes and other similar structures and on surfaces as indicated in the Contract Documents.

C. Unless otherwise shown on the Drawings or specified elsewhere in these Specifications waterproofing coating is not required on interior surfaces of vaults or manholes.
D. Moistureproofing coating shall be applied to all buried surfaces of concrete and masonry retaining and building walls.

3.02 BELOW-GRADE ELASTOMERIC WATERPROOFING COATING SYSTEM FOR EXTERIOR SURFACES

A. Surface Condition and Preparation:

1. Surfaces shall be dry and free of oil, dirt, curing compound, laitance or any other such debris or contamination to produce a clean foundation for bonding with the coating.

2. Masonry surfaces shall be allowed to age for at least 14 Calendar Days. Holes or other joint defects shall be filled with mortar and repointed. Loose or splattered mortar shall be removed by scraping and chipping. Masonry surfaces shall be cleaned by washing and scrubbing with clear water. Muriatic acid shall not be used. After cleaning, masonry surfaces shall be sealed or filled with sealer or block filler.

3. Concrete surfaces shall be stripped of forms and the concrete allowed to age for at least 14 Calendar Days. Cracks, holes or other defects in the concrete surface shall be repaired with epoxy or non-shrink grout as applicable.

B. Application:

1. Apply 60 wet mils of waterproofing membrane, followed by setting reinforcing fabric into wet material. Overlap fabric edges 3 inches minimum. Allow first coat to cure as per manufacturer’s recommendations and then apply second 60 wet-mil coat of waterproofing membrane.

2. After waterproofing membrane is cured, install protection board in accordance with manufacturer’s recommendations and prior to backfilling.

3.03 CAPILLARY WATERPROOFING COATING

A. Location: Should a condition exist which does not allow the masonry or concrete to properly age as required in Paragraph 3.02 A.2, capillary waterproofing shall be applied. As an alternative to other waterproofing coating system specified herein, capillary waterproofing may be applied if approved by the Engineer.

B. Surface Preparation:
1. All surfaces to receive waterproofing must be clean and free from oil, grease, paint, loose dust and laitance or any other such debris or contamination to produce a clean foundation for bonding with the coating.

2. Horizontal surface should not have curing agents or hardeners applied prior to the application of waterproofing formulations.

3. All concrete surfaces shall be hosed down with water, as moisture must be present in the capillaries prior to the application of capillary formulation.

4. Concrete surfaces shall be stripped of forms, the concrete allowed to age for at least 3 Calendar Days and then shall be surface wetted.

C. Application:

1. Capillary waterproofing formulation shall be a minimum of two coats, applied at the rate per manufacturer’s recommendations using suitable spraying and/or brushing. Application amount shall be a minimum of 2.5 lbs/sq. yd. Drying time between coats shall be as recommended by the coating manufacturer.

2. Curing of applied waterproofing formulation shall be done using fog spray 2 or 3 times a day for two days after application.

3. Backfilling shall be not allowed within 24 hours of application.

3.04 MOISTUREPROOFING COATING SYSTEM

A. Surface Preparation:

1. Masonry surfaces shall be allowed to age for at least 7 Calendar Days. Holes or other joint defects shall be filled with mortar and repointed. Loose or splattered mortar shall be removed by scraping and chipping. Masonry surfaces shall be cleaned by washing and scrubbing with clear water. Muriatic acid shall not be used. After cleaning, masonry surfaces shall be sealed or filled with sealer or block filler compatible with the indicated primer.

2. Concrete surfaces shall be allowed to age for at least 7 Calendar Days. Cracks, holes or other defects in the concrete surface shall be repaired with epoxy or non-shrink grout as applicable. Concrete surfaces shall be free of oil, dirt, laitance or any other such debris or contamination to produce a clean foundation for bonding with the coating.

B. Application: Apply minimum of two coats of moistureproofing materials in accordance with manufacturer’s recommendations.
END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Throughout the Work, seal and caulk joints where shown on the Drawings and elsewhere as required to provide a positive barrier against passage of moisture and air.

B. Furnish all labor, material, equipment, incidentals, and services necessary to install the following:

1. Joint sealants for exterior and interior structure components.

1.02 RELATED WORK

Concrete Work is included in Section 03 30 00.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 32 19:

1. Product data:
   a. Materials list of items proposed to be provided under this Section
   b. Manufacturer’s data and installation procedures

1.04 REFERENCE STANDARDS

A. American Society of Testing and Materials (ASTM)

C792 Standard Test Method for Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealants

C834 Standard Specification for Latex Sealants

C919 Standard Practice for Use of Sealants in Acoustical Applications

C920 Standard Specification for Elastomeric Joint Sealants

C1193 Standard Guide for Use of Joint Sealants
1.05 DEFINITIONS

A. Sealant Products: Any material with adhesive properties that is used to fill, seal, or waterproof gaps or joints between two surfaces. Sealant products include sealant, primers and caulk.

B. Type: Defines whether products are single-component and premixed or multicomponent and require mixing at job site.
   1. Type S: Single-component products furnished in prepackaged cartridges or other forms in which no job-site mixing is required.
   2. Type M: Multicomponent products furnished in two or more parts that must be mixed at the job site.

C. Grade: Defines the flow characteristics of the sealant.
   1. Grade P: Products having sufficient flow to fill joints in horizontal surfaces and remain level and smooth at temperatures as low as 40 degrees Fahrenheit (4.4 degrees Celsius).
   2. Grade NS: Non-sag or gunnable sealant that permits application in joints on vertical surfaces without sagging or slumping when applied at temperatures between 40 degrees F (4.4 degrees C) and 122 degrees F (50 degrees C).

D. Movement Class: Indicates sealant’s movement capacity (expansion and contraction).
   1. Classes 100/50, 50, 35, 25, 12 ½: The numbers indicate movement capability as percentage of the width of the joint.

E. Use Class: Identifies sealants according to their use categories for exposure and substrate.
   1. T: Sealants designed for joints in surfaces subject to pedestrian and vehicular traffic.
   2. NT: Sealants designed for non-traffic exposure.
   3. I: Sealants designed for submerged condition.
   4. M, G, A: Refers to sealants which remain adhered to mortar (M), glass (G), and aluminum (A), respectively.
   5. O: Sealants for substrate materials other than M, G, and A.
1.06 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed joint sealant applications similar in material, design, and extent to that indicated for the Work that have resulted in construction with a record of successful in-service performance.

B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

C. Mixing and Application of Sealants: Mix and apply sealants in accordance with the manufacturer's printed instructions. Initial mixing and application shall be under the direct supervision of the manufacturer's representative.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL

A. Compatibility: Provide joint sealant, joint filler, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Manufacturers: Products made by the following manufacturers, provided they comply with requirements of Contract documents, will be among those considered acceptable.

1. Dow Corning Corporation
2. General Electric Co., GE Silicones
3. Pecora Corporation
4. Sonneborn Building Products Division/Chemrex, Inc.
5. Tremco, Inc.
6. Sika Corp.
2.02 SEALANTS

A. Elastomeric Joint Sealant: Type S; Grade NS; Class 25; Uses T, NT, M, G, A, and as applicable to uses indicated, and O. Elastomeric joint sealers shall be used for interior surfaces where noted and at all non-protected exterior applications. Provide manufacturer's standard chemically curing, elastomeric silicone sealant, which complies with ASTM C920 requirements, including those for type, grade, class and uses, and as recommended by the manufacturer for the intended use.

B. Multi-Part Polyurethane Sealant: Two-part elastomeric sealant. Comply with ASTM C920, Type M, Class 25, Grade P or NS.

C. Provide the following sealants or equals as approved by the Engineer for a complete and proper installation.

1. Sealant Type S-1 (at joints subjected to vehicular or pedestrian traffic):
   a. ASTM C920, Polyurethane, Type S, Grade P, Class 25
   b. Acceptable products:
      (1) Sika Corp., Sikaflex - 1CSL or approved equivalent

2. Sealant Type S-2 (at vertical joints):
   a. ASTM C920, Polyurethane, Type M, Grade NS, Class 25
   b. Acceptable products:
      (1) Sika Corp., Sikaflex - 2C NS/SL or approved equivalent

3. Sealant Type S-3 (at steel to concrete/masonry, metal to metal, vertical joints):
   a. ASTM 920, Polyurethane, Type S, Grade NS, Class 25
   b. Products:
      (1) Sika Corp., Sikaflex – 15ML or approved equivalent

D. For other services, except as may be called for on the Drawings, provide products especially formulated for the proposed use and approved in advance by the Engineer.

E. Colors: Unless otherwise specified, use sealants with standard grey or black color.
2.03 PRIMERS

Use only those primers which have been tested for durability on the surfaces to be sealed and are specifically recommended for this installation by the manufacturer of the sealant used. Primer shall be provided where required for adhesion of sealant to joint substrates indicated.

2.04 JOINT SEALANT BACKING MATERIALS

A. General: Provide sealant backing of material and type that are nonstaining; compatible with joint substrates, sealant, primer and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Elastomeric Tubing Joint Filler: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26°F. Provide product with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.05 MASKING TAPE

For masking around joints, provide an appropriate masking tape, which will effectively prevent application of sealant on surfaces not scheduled to receive it and which is removable without damage to substrate.

2.06 MISCELLANEOUS MATERIALS

A. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturer of sealant and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

B. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the acceptance of the Engineer.
PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

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

3.02 PREPARATION

A. Concrete surfaces:
   1. Install only on surfaces that are dry, sound, and well brushed, wiping free from dust.
   2. At open joints, remove dust by mechanically blown compressed air if so required.
   3. To remove oil and grease, use sandblasting or wire brushing.
   4. Where surfaces have been treated, remove the surface treatment by sandblasting or wire brushing.
   5. Remove laitance and mortar from joint cavities.

B. Steel surfaces:
   1. Steel surfaces in contact with sealant:
      a. Sandblasting as required to achieve acceptable surface for bond.
      b. If sandblasting is not practical or would damage adjacent finish, scrape the metal or wire brush to remove mill scale and rust.
      c. Use solvent to remove oil and grease, wiping the surfaces with clean white rags only.
   2. Remove protective coatings on steel by sandblasting or by using a solvent that leaves no residue.

C. Aluminum surfaces:
   1. Aluminum surfaces in contact with sealant:
      a. Remove temporary protective coatings, dirt, oil, and grease.
b. When masking tape is used for protective cover, remove the tape just prior to applying the sealant.

2. Use only such solvents to remove protective coatings as are recommended for that purpose by the manufacturer of the aluminum work and which are non-staining.

3.03 INSTALLATION OF BACKUP MATERIAL

A. When using backup of tube or rod stock, avoid lengthwise stretching of the material. Do not twist or braid hose or rod backup stock.

B. Installation tool:

1. For installation of backup material, provide a blunt-surfaced tool of wood or plastic, having shoulders designed to ride on the adjacent finished surface and a protrusion of the required dimensions to assure uniform depth of backup material below the sealant.

2. Do not, under any circumstance, use a screwdriver or similar tool for this purpose.

3. Using the approved tool, smoothly and uniformly place the backup material to the depth indicated in the Contract Documents, compressing the backup material 25% to 50% and securing a positive fit.

3.04 PRIMING

Prime joint substrates where recommended by joint sealant manufacturer. Apply primer to comply with joint sealant manufacturer’s recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.05 BOND-BREAKER INSTALLATION

Provide an approved bond-breaker where recommended by the manufacturer of the sealant and where directed by the City, adhering strictly to the manufacturer’s installation recommendations. Bond-breakers shall be installed between sealants where backer rods are not used between sealants and joint fillers or back of joints.

3.06 INSTALLATION OF JOINT SEALANTS

A. Prior to start of installation in each joint, verify the joint type according to details on the Drawings or as otherwise directed by the City and verify that the required proportion of width of joint to depth of joint has been secured.
B. Comply with joint sealant manufacturer’s installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

C. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

D. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

E. Thoroughly and completely mask joints where the appearance of primer or sealant on adjacent surfaces would be objectionable.

F. Installation of Sealant: Install sealant by proven techniques that result in sealant directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealant at the same time sealant backing is installed.

G. Immediately after sealant application and prior to time skinning or curing begins, tool sealant to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

2. Do not use tooling agent unless specifically so recommended in writing by the manufacturer of the sealant.

3.07 INSTALLATION LOCATIONS

A. At locations shown or noted on Drawings.

B. At control and construction joints, where specified.

C. In and around all facilities and equipment which normally receive caulking and sealant as part of accepted industry standard and as recommended by the manufacturers.
3.08 CLEANING

A. Remove masking tape immediately after joints have been tooled.

B. Clean adjacent surfaces free from sealant as the installation progresses, using solvent or cleaning agent recommended by the manufacturer of the sealant used.

C. Upon completion of the work of this Section, promptly remove from the Site all debris, empty containers, and surplus material derived from this portion of the Work.

3.09 PROTECTION

Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes.

END OF SECTION
SECTION 08 38 50

SOUND CONTROL DOORS

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, material, equipment, appurtenances and incidentals required and install sound control door assembly of type and size, complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Metal Work - General Provisions are included in Section 05 50 00.

B. Finish Hardware is included in Section 08 71 00.

C. Architectural Painting is included in Section 09 90 00.

D. Shop Coating is included in Section 09 91 00.

1.03 REFERENCE STANDARDS

ANSI A250.8 SDI-100 Recommended Specifications for Standard Steel Doors and Frames

ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A1008 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and bake Hardenable

ASTM B117 Standard Practice for Operating Salt Spray (Fog) Apparatus


1.04 SUBMITTALS

A. The following shall be submitted to the Engineer in compliance with Section 01 32 19.

1. Manufacturer’s product data, including catalog cuts and installation procedures.

2. Shop drawings: Indicate door opening criteria, elevations, sizes, types, swings; identify and detail cutouts for each door. Coordinate with the door hardware to be provided.

3. Product data and details of anchorages, seals, door bottoms, thresholds, and accessories to be provided.

4. Certification shall be furnished as part of the shop drawing submittal that the STC rating is in accordance with ASTM E90-75 testing procedures as conducted by an approved acoustical products testing laboratory.

5. Painting and coating data.


7. Schedule: Provide a schedule of sound control door assemblies prepared by or under the supervision of supplier, with identification/location of each door as shown on drawings. Coordinate with the Door Hardware Schedule provided in Section 08 71 00 and as noted on the Drawings.

1.05 SYSTEM DESCRIPTION

A. Design requirements: Door assemblies shall include doors, frames and door hardware to install gasketing systems, retainers and retainer covers, automatic or fixed door bottoms, cam-lift hinges, thresholds, and sills as required to achieve specified requirements.
B. Performance requirements: Installed assembly shall have Sound Transmission Coefficient rating of STC 32 minimum when tested as operable door assembly in accordance with ASTM E90 and ASTM E413.

C. STC rating is not required for doors with louvers. Doors with louvers shall be provided where shown on the Drawings.

1.06 QUALITY ASSURANCE

A. The Contractor shall coordinate with the door manufacture for required rough opening.

B. Test Reports: Certified laboratory reports performed in accordance with ASTM E90 and ASTM E413 from independent testing laboratory qualified under the National Voluntary Laboratory Accreditation Program (NVLAP) supporting compliance of assemblies to specified requirements.

C. Qualifications: Door manufacturer shall have been engaged in the regular manufacture of sound control doors for a period of at least five (5) years.

D. Unless specifically otherwise approved by the City, provide all products of this Section from a single manufacturer.

E. Use adequate numbers of skilled workers thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Doors and frames shall be shipped and stored with temporary stiffeners and spacers in place to prevent distortion in accordance with HMMA 840.

B. Doors and frames shall be delivered in original, unbroken packages, containers or bundles bearing the name of the manufacturer.

C. Store metal work under cover at Site. Do not store in a manner that traps excess humidity. Provide minimum ¼-inch space between each stacked door to permit air circulation. Doors and frames shall be stacked in a vertical upright position.

D. Additional requirements for delivery, handling and storage as specified in Section 01 65 00.
PART 2 - PRODUCTS

2.01 GENERAL

A. Sizes of doors shown on the Drawings are nominal sizes.

B. Door assemblies including door leaves, frame and finish hardware shall be assembled and installed in the factory (pre-hung). Knock down frames shall not be allowed.

C. Sound control door assemblies shall be as manufactured by Ceco, Krieger Steel Products Co., or approved equivalent.

D. Assemblies shall be STC rated as indicated in Paragraph 1.05.

E. Door frames and seal retainers shall be thoroughly cleaned, phosphatized, and factory primed with rust-inhibitive primer.

2.02 FRAMES

A. Use welded-type frames only.

B. Frames for 1-3/4" doors shall be fabricated from 14-gauge galvannealed steel minimum, and for doors greater than 1-3/4" thickness, 12-gauge minimum prime quality steel. Corners shall be mitered, and welded and ground smooth.

C. Strike, hinge and other hardware reinforcement shall be of not less than 3/16" thick steel and spot welded in place. Frames shall be furnished with welded-in floor anchors in each jamb and a temporary steel spreader to prevent distortion in shipment.

D. Perimeter seals shall be magnetic type.

2.03 SOUND CONTROL DOOR

A. Thickness of door shall be as required to provide a sturdy, stable, rigid door that meets the specified STC rating. Thickness of the door shall not be less than 1-3/4".

B. Door shall be fabricated from not less than 14-gauge steel minimum face sheets joined on the vertical edges with continuous welds. Visible seams on face sheets are not permitted. Grind, fill and dress welds to provide smooth, flush surfaces. Door top and bottom shall be reinforced and completely closed with die formed 12-gauge steel channels welded in place. Core shall be incombustible fiberglass filler.
C. Double doors shall be comprised of one fixed side and one active side.

D. Automatic Door Bottom for door shall be Kriegersonic DB-2 or approved equal and shall close the entire gap between the door and floor. The actuating mechanism shall compress or retract the seal properly when the outer face of the door is within 2 inches of the strike jamb.

E. Provide door complete with magnetic type perimeter seals.

F. Provide louvers as shown on the Drawings. Louvers shall be provided for only those doors that are identified on the Drawings with louvers.

2.04 GLAZING

A. Glazing shall be provided on doors where shown on the Drawings.

B. Viewing area shall be unobstructed within the frame provided and shall be clear with no color or tint. Viewing area shall be a minimum of 90% of rough opening size called out on plan.

C. Glazing shall be double, ¼-inch thick minimum laminated safety glass.

D. Glazing shall be designed to meet the STC requirements of the door assembly.

2.05 SILL CONDITION

Furnish a smooth, flush aluminum threshold for the door bottom to seal against when the door is in the closed position. The minimum width of the threshold shall be door thickness plus 4” to allow the threshold to extend a minimum of 1” beyond the face of the door on both sides of the opening.

2.06 ASTRAGALS

A. Astragals for double doors shall be adjustable.

B. Astragals shall have self-aligning magnetic-type compression seal.

C. Astragals shall be designed to meet the STC requirements of the door assembly through its range of adjustment.

2.07 FINISH

A. All tool marks and surface imperfections shall be removed and exposed faces of all welded joints shall be dressed smooth. Assemblies shall be treated and
shall be coated on all accessible surfaces with a rust-inhibitive primer that meets ASTM B117 salt spray for 150 hours and which is fully cured prior to shipment.

B. Final finishes shall be as per Division 9.

2.08 FINISH HARDWARE

A. Secure templates from the finish hardware supplier, and accurately install, or make provision for, all finish hardware at the factory.

B. Finish hardware shall be in accordance with Section 08 71 00.

PART 3 - EXECUTION

3.01 GENERAL

A. The sound control door and frame assemblies shall be installed per the manufacturer's written instructions.

B. Coordinate installation with work of other trades. Ensure that rough openings requirements are coordinated with General Contractor.

C. Level subfloor and threshold so that they contact a straightedge for the length of the threshold.

3.02 INSTALLATION

A. General: Install sound control door assemblies plumb, rigid, properly aligned and securely fastened in place; comply with manufacturer's written instructions.

B. Frames:

1. Set frames accurately in position; plumb, aligned, and braced securely until permanent anchors are set.

2. Where practicable, place frames prior to construction of enclosing walls and ceilings.

3. At in-place construction, set frames and secure to adjacent construction with machine screws and suitable anchorage devices. Provide "Z" fillers at each screw location.

4. Door frame shall properly set so that the frame gap to the door is consistent
and there is even contact with all seals.

5. Remove temporary braces only after frames or bucks have been properly set and secured.

6. Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.

7. Solidly fill space between frames and substrate with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.

8. Caulking shall be performed prior to finish painting of the door assembly.

C. Doors:

1. Fit doors accurately in frames, within clearances indicated below. Shim as necessary.
   a. Jambs: 1/8 inch
   b. Head with Butt hinges: 1/8 inch
   c. Sill: Manufacturer’s standard
   d. Between edges of pairs of doors: 1/8 inch

2. Doors shall swing freely without binding, sticking or sagging.

3. Install and adjust door hardware. Install hardware in accordance with Section 08 71 00.

D. The magnetic seals shall be installed so that they are in contact with the entire length of the jambs and head.

E. No gaps shall occur at the joint between the head and jamb seals.

F. The drop threshold shall be adjusted so that the seal is in full contact with the floor surface. Under no circumstances shall the downward force exerted by the drop seal against the floor cause binding at the head. If this occurs and cannot be corrected, the entire installation shall be replaced as required.

### 3.03 ADJUST, CLEAN, AND FINISH PAINT

A. Immediately after erection, sand smooth all rusted and damaged areas of prime coat, and apply touchup of compatible air-drying primer.

B. Clean grout off door frames immediately after installation.

C. Check pressure on seals to ensure positive seals without crushing or
compressing the seals excessively.

D. Remove and replace defective work, including defective or damaged sound seals, doors and frames that are warped, bowed, or otherwise unacceptable. Adjust gaskets, gasket retainers, and retainer covers to provide contact required to achieve required minimum STC rating.

E. Check and readjust operating finish hardware items in hollow metal work just prior to final inspection. Leave work in complete and proper operating condition.

F. Apply finish coating per Section 09 90 00.

3.04 FIELD TESTING AND SERVICE

A. Manufacturer’s representative(s) shall inspect and test for proper installation and operation in conformance with manufacturer’s recommended procedures and in accordance with the Specification.

B. Any failure of inspection or testing shall immediately be corrected by the Contractor to the satisfaction of the City and manufacturer’s representative and meeting the requirements of the Specifications.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and install finish hardware throughout the work as per the Contract Documents and as needed for a complete and proper installation.

1.02 REFERENCES

A. AA – Aluminum Association
B. ADA – Americans with Disabilities Act
C. ANSI A117.1 – Standard for Accessible and Usable Buildings and Facilities
D. BHMA – Builders’ Hardware Manufacturers Association
E. CBC – California Building Code
F. DHI – Door and Hardware Institute
G. NAAMM – National Association of Architectural Metal Manufacturers
H. NFPA 80 – Standard for Fire Doors and Other Opening Protectives
I. CBC – California Building Code
J. CDA – Copper Development Association
K. SDI – Steel Door Institute
L. WIC – Woodwork Institute of California

1.03 COORDINATION

Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.
1.04 SUBMITTALS

A. Submit schedule, shop drawings, and product data in accordance with Section 01 32 19.

B. Schedule and Product Data:

1. A "Door Schedule," listing all doors in the work, their locations, sizes, materials labels, and Hardware Group.

2. A "Finish Hardware Schedule," listing each of the proposed "Hardware Groups" and defining in detail the proposed contents of each Hardware Group.

3. Product data, including finish of each item.

4. Indicate quantity, complete part numbers and installation location for each piece of hardware.

5. Provide final keying charts for City’s approval.

1.05 QUALITY ASSURANCE

A. Manufacturers: Companies specializing in manufacturing door hardware with minimum five years’ experience.

B. Hardware Supplier: Company specializing in supplying institutional door hardware with three years documented experience.

C. All like items shall be supplied by one manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01 65 00.

B. Package hardware items individually, group small items together, label and identify package with door opening code to match hardware schedule. Identify location of each door opening. Deliver in strong sturdy containers.

C. Deliver keys to the City by security shipment direct from lock manufacturer.

D. Protect hardware from theft by cataloging and storing in dry, secure area.
PART 2 - PRODUCTS

2.01 GENERAL

A. Fasteners:

1. Furnish necessary screws, bolts, and other fasteners of suitable size and type to anchor the hardware in position for long life under hard use.

2. Where necessary, furnish fasteners with expansion shields, toggle bolts, sex bolts, and other anchors approved by the Engineer, according to the material to which the hardware is to be applied and according to the recommendations of the hardware manufacturer.

B. Where butts are required to swing 180 degrees, furnish butts of sufficient throw to clear the trim.

C. Furnish silencers for door frames at the rate of three for each single door and two for each door of pairs of doors; except weather stripped doors and doors with light seals or sound seals.

D. Like components shall be same in style, color, finish and manufacture throughout the project with differing sizes as required.

2.02 MANUFACTURERS

<table>
<thead>
<tr>
<th>Hardware Item</th>
<th>Listed Manufacturer</th>
<th>Approved Equals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door Butts/Hinges</td>
<td>Hager (HGR)</td>
<td>Lawrence, McKinney</td>
</tr>
<tr>
<td>Locks &amp; Cylinders</td>
<td>Corbin-Russwin (COR)</td>
<td>Schlage &quot;D&quot; Series</td>
</tr>
<tr>
<td>Door Closers</td>
<td>Norton Door Controls (NDC)</td>
<td>Yale</td>
</tr>
<tr>
<td>Panic Devices</td>
<td>Von Duprin (VON)</td>
<td>As Specified</td>
</tr>
<tr>
<td>Astragal</td>
<td>National Guard Products (NGP)</td>
<td>Pemko</td>
</tr>
<tr>
<td>Push/Pulls, Kick Plates</td>
<td>Trimco (TRI)</td>
<td>Burns Manufacturing</td>
</tr>
<tr>
<td>Overhead Stops and Holders</td>
<td>Norton Door Controls (NDC)</td>
<td>As Specified</td>
</tr>
<tr>
<td>Wall and Floor Stops &amp; Bolts</td>
<td>Trimco (TRI)</td>
<td>Burns Manufacturing</td>
</tr>
<tr>
<td>Weatherstrip, Sweep Thresholds</td>
<td>National Guard Products (NGP)</td>
<td>Pemko</td>
</tr>
</tbody>
</table>
2.03  FINISHES

A. Finishes conforming to the following standards of symbols:

<table>
<thead>
<tr>
<th>Finish/Description</th>
<th>US Symbol</th>
<th>BHMA No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satin Chromium</td>
<td>26D</td>
<td>626</td>
</tr>
<tr>
<td>Satin Aluminum, Clear Anodized</td>
<td>28</td>
<td>628</td>
</tr>
<tr>
<td>Satin Stainless Steel</td>
<td>32D</td>
<td>630</td>
</tr>
<tr>
<td>Aluminum Painted</td>
<td>65</td>
<td>689</td>
</tr>
<tr>
<td>Satin Aluminum, Dark Bronze Anodized</td>
<td>313AN</td>
<td>710</td>
</tr>
</tbody>
</table>

2.04  KEYING

A. All locks and cylinders shall be keyed to a new 6-pin Grand Master key system. Furnish 3 change keys per locks. Furnish 6 of each Master key. Keys shall be matched to City’s existing Pump Stations Keys. Coordinate with the City for requirements.

B. All keying shall be completed and registered at the lock factory. Provide key bitting chart to the City when requested to do so in writing.

C. All keying requirements shall be established by hardware distributor with input from the City.

D. Construction keying:

1. Furnish a construction master key system with 5 keys for locks and cylinders.

2. Use only the construction keys during construction.

3. At the time of final acceptance of the work, void the construction key system and, in the presence of the City, demonstrate that the specified keying system is operating properly.

E. Identification and delivery:

1. Factory stamp permanent keys, "DO NOT DUPLICATE."

2. Identify permanent keys with tags and deliver to the City.
2.05 TOOLS AND MANUALS

With the delivery of permanent keys, deliver to the City one complete set of adjustment tools and one set of maintenance manuals for lock sets, latch sets, closers, and panic devices.

2.06 LOCKS

A. Locks shall be as scheduled with 2-3/4” backset. Locks for labeled doors shall have a fusible link mechanism to prevent retraction in the event of fire.

B. Furnish strikes with curved lip of sufficient length to clear trim and protect clothing.

2.07 DOOR CLOSERS

A. Provide adjustable heavy-duty closers with the following maximum pressure for opening doors. Adjust closers after installation.

<table>
<thead>
<tr>
<th></th>
<th>5.0 pounds pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior Doors</td>
<td></td>
</tr>
<tr>
<td>Exterior Doors</td>
<td>8.5 pounds pressure</td>
</tr>
</tbody>
</table>

B. Comply with Title 24, CCR, Part 2, Section 2-3304 (1).

C. Door closers shall be sized according to size and weight of door being installed.

D. Door closers shall have a hold open feature that allows the holding of the door in the open position between 90 degrees and 180 degrees for 180-degree doors and between 85 degrees and 110 degrees for 110-degree door.

2.08 CAM-LIFT HINGES

A. Hinges shall be of the cam-lift butt type and manufactured of stainless steel.

B. Number of hinges shown in Section 2.14 of this Section is minimum required. Contractor shall install additional hinges as required for the proper operation of the door.

C. Hinges shall be minimum 3/16” thick x 4 1/2” wide x 6” long.

D. Hinges shall be rated by the hinge manufacturer to be capable of a minimum service load of 2,800 ft-lb of torque or 350 lbs. dead service load each hinge.

E. Provide sufficient hinge width to clear trim and allow 180-degree swing.
2.09 BUTT HINGES

A. Hinges shall be of the butt type and manufactured of stainless steel.

B. Number of hinges shown in Section 2.14 of this Section is minimum required. Contractor shall install additional hinges as required for the proper operation of the door.

C. Provide sufficient hinge width to clear trim and allow 110-degree swing.

2.10 PANIC DEVICES

A. All panic devices must meet ANSI Standard 156.3, Grade 1. Panic Devices must be UL listed and California State Fire Marshal listed.

B. All rail assemblies shall be made of brass, bronze or stainless steel.

C. Springs shall be manufactured of stainless steel.

D. Push rail height shall be 40" from floor to centerline.

E. All trim shall be thru bolted.

2.11 THRESHOLDS AND DOOR SEALS

A. Thresholds shall be made from AA 6063-T5 aluminum alloy, and/or CDA 385 alloy bronze (brass) as noted in hardware schedule.

B. All housings for door seals shall be anodized finishes.

C. Provide seals & thresholds as noted in hardware schedule and/or on sill details. All exterior thresholds shall be set in a full bed of butyl mastic.

D. Thresholds for acoustically insulated doors shall be 4” wide minimum, mounted with smooth side in contact with the door seal and Model 8144DKB as manufactured by National Guard Products, Inc. or approved equal.

2.12 PUSH-PULLS, STOPS & KICKPLATES, AUTO FLUSHBOLTS

A. All products shall be provided by one manufacturer in aluminum, brass, bronze or stainless steel base metals.

B. Kick plates to be 0.05-inch thick material, beveled on four edges. Sharp edges on push, pull and kick plates will be subject to rejection and replacement. All floor stops & holders shall be mounted within 4 inches of adjacent walls or partitions.
2.13 OTHER MATERIALS

Provide other materials not specifically described but required for a complete and proper installation.

2.14 SCHEDULE OF HARDWARE SET PRODUCTS

| HARDWARE SET NO. 1 - FOR PUMP & ELECTRICAL ROOM EXTERIOR DOORS |
|---------------------------------|-----------------|-----------------|-----------------|
| NAME                            | QUANTITY | DESCRIPTION/MODEL | FINISH  | MANUFACTURER |
| Hinge                           | 6        | Cam Lift          | 630     | HGR           |
| Surface Bolt                    | 2        | 3922 x 1/24” & 1/12” | 630    | TRI           |
| Panic Bar Set                   | 1        | 98-27-EO-F-SNB    | 630     | VON           |
| Closer                          | 2        | PR7500H           | 689     | NDC           |
| Kick Plate                      | 2        | K0050 10” x 2” LDW B4E | 630    | TRI           |
| Door Stop                       | 2        | 1209W             | 626     | TRI           |
| Threshold                       | 1        | 8144DKB           | 628     | NGP           |
| Sweep                           | 2        | C607A             | 628     | NGP           |
| Seal                            | 1 Set    | FATT700SA @ HEAD & JAMBS | 628 | NGP |
| Astragal                        | 1 Set    | As approved by Engineer | NGP | |
| Lock, Key and Handle on Exterior | 1 Set    | As approved by Engineer | 630 | COR |

NOTES:
1. See Paragraph 2.02 for manufacturers’ abbreviations and names.
2. See Paragraph 2.03.A for finish designation and description.
3. Door swing to be 180 degrees or less as required to avoid door or hardware interference with fixed objects.

| HARDWARE SET NO. 2 - FOR DOOR ON INTRMEDIATE WALL (BETWEEN TWO ROOMS) |
|---------------------------------|-----------------|-----------------|-----------------|
| NAME                            | QUANTITY | DESCRIPTION/MODEL | FINISH  | MANUFACTURER |
| Hinge                           | 3        | Cam Lift          | 630     | HGR           |
| Panic Bar Set                   | 1        | 98-EO-F           | 630     | VON           |
| Closer                          | 1        | PR7500H           | 689     | NDC           |
| Kick Plate                      | 1        | K0050 10” x 2” LDW B4E | 630    | TRI           |
| Door Stop                       | 1        | 1214CK x 1268CK   | 626     | TRI           |
| Threshold                       | 1        | 8144DKB           | 628     | NGP           |
| Sweep                           | 1        | C607A             | 628     | NGP           |
| Seal                            | 1 Set    | FATT700SA @ HEAD & JAMBS | 628 | NGP |

NOTES:
1. See Paragraph 2.02 for manufacturers’ abbreviations and names.
2. See Paragraph 2.03.A for finish designation and description.
3. Door swing to be 110 degrees.
PART 3 - EXECUTION

3.01 INSTALLATION

A. Install items in accordance with manufacturer’s written instructions.

B. Use the templates provided by hardware item manufacturer.

C. Door closers shall be located to provide the proper degree of opening.

D. Mounting heights for hardware:
   1. Locksets: 40-5/16 inches from floor to centerline of lever or handle.
   2. Hinges: 5 inches from head of opening to top of top hinge, 10 inches from finish floor to bottom of bottom hinge, and intermediate hinge(s) spaced equidistant between top and bottom butts.

E. After fitting hardware to doors, remove all finish hardware except hinges, carefully replace in properly marked boxes, and place in storage until painting and finishing is completed. After painting and finishing is completed, permanently install finish hardware.

F. Secure finish hardware with suitable fasteners of the same material and finish as the item being attached.

G. Provide expansion anchors for attaching hardware items to concrete or masonry.

H. Screws for strikes, faceplates and similar items shall be flat phillips head, countersunk type; provide machine screws for metal.

I. Screws for hinges shall be flat phillips head, countersunk, full-thread type.

J. Fastening of closer bases of closer shoe to doors shall be by means of sex bolts and spray painted to match closer finish.

K. Upon completion of the work, provide the inspection and adjustment, as required, for all finish hardware and door closers.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

The work of this Section includes providing gypsum board over wood or light gauge metal framing and furring members, and providing ceiling suspension and furring systems for gypsum board ceilings wherever wood ceiling joists are not indicated, and all appurtenant work, complete.

1.02 RELATED WORK

A. Sealants and Caulking are included in Section 07 92 00.

B. Architectural Painting is included in Section 09 90 00.

1.03 CODES

A. The work of this Section shall comply with the current editions of the following codes:

1. California Building Code

2. California Fire Code

1.04 REFERENCE STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the work of this Section:

1. Federal Specifications:

   QQ-W-461 Wire, Steel, Carbon (Round, Bare, and Coated)

2. Commercial Standards:

   ASTM C208 Standard Specification for Cellulosic Fiber Insulating Board

   ASTM C475 Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
<table>
<thead>
<tr>
<th>Standard Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM C514 Standard Specification for Nails for the Application of Gypsum Board</td>
</tr>
<tr>
<td>ASTM C645 Standard Specification for Nonstructural Steel Framing Members</td>
</tr>
<tr>
<td>ASTM C754 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products</td>
</tr>
<tr>
<td>ASTM C1396 Standard Specification for Gypsum Board</td>
</tr>
<tr>
<td>ASTM D2626 Standard Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing</td>
</tr>
</tbody>
</table>

3. Trade Standards:

- GA-216 (Gypsum Assn.) Application and Finishing of Gypsum Panel Products
- GA-600 (Gypsum Assn.) Fire Resistance and Sound Control Design Manual

1.05 SUBMITTALS

A. The following shall be submitted in compliance with Section 01 32 19:

1. Product Data:

   a. Materials list of items proposed to be provided under this Section.

   b. Manufacturer's literature, installation instructions, and samples of all proposed materials, including metal trim and furring devices.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Manufactured materials shall be delivered in original unbroken packages, containers, or bundles bearing the manufacturer's name and product description and rating.

B. All materials shall be carefully stored in an area that is protected from deleterious elements in a manner recommended by the material manufacturer. Storage shall be in a manner that will prevent damage to the material and its finish.
PART 2 - PRODUCTS

2.01 GENERAL

A. The gypsum board products shall be in accordance with the manufacturer's literature and published specifications for the products indicated.

B. Fire-rated materials shall bear testing agency labels and required fire classification numbers.

2.02 GYPSUM BOARD

A. All gypsum board shall be fire-rated unless otherwise indicated.

B. All gypsum board shall be 5/8-inch thick and provided with tapered edges unless otherwise indicated.

1. All gypsum board shall conform to ASTM C36, type "x", unless otherwise indicated.

2. Water-resistant gypsum board shall conform to ASTM C630, regular, type "x."

3. Tile-backing board shall be Portland cement slurry, reinforced with fiberglass mesh and coated vinyl board. The board shall be not less than 1/2-inch thick and shall be designed for use behind tile.

2.03 TAPE AND COMPOUND

Joint reinforcing tape and joint compound shall conform to ASTM C475.

2.04 FASTENERS

A. Nails shall conform to ASTM C514 and shall be of the length recommended by the Gypsum Association referenced standards and the California Building Code for various gypsum board thicknesses. Nails for nailing tile backing board to wood studs shall be 1 1/4-inch galvanized roofing nails unless otherwise required by CBC and board manufacturer.

B. Screws shall be self-drilling, self-tapping, bugle head for use with power tools, length as recommended by Gypsum Association referenced standards and the Building Code.

1. Type "S" for board to sheet metal application
2. Type "W" for board to wood application
3. Type "G" for board to board application
4. Type "S" or "S-12," 1-1/4-inch for tile backing board to metal studs application

C. Resilient channels shall be metal channels designed for use with sound wall construction. They shall be as recommended and approved by the gypsum board manufacturer and code.

2.05 ADHESIVES

Adhesives for fastening gypsum board to gypsum board shall be in accordance with the printed recommendations of the gypsum board manufacturer.

2.06 METAL TRIM

A. Form from zinc-coated steel not lighter than 26 gauge, complying with Fed Spec QQ-S-775, Type I, Class d or e.

B. Casing beads:

1. Provide channel-shapes with an exposed wing and with a concealed wing not less than 7/8-inch wide.

2. The exposed wing may be covered with paper cemented to the metal, but shall be suitable for joint treatment.

C. Corner beads: Provide angle shapes with wings not less than 7/8-inch wide and perforated for nailing and joint treatment, or with combination metal and paper wings bonded together, not less than 1 1/4-inch wide and suitable for joint treatment.

D. Edge beads for use at perimeter of ceilings:

1. Provide angle shapes with wings not less than 3/4-inch wide.

2. Provide concealed wing perforated for nailing, and exposed wing edge folded flat.

4. Exposed wing may be factory finished in white color.

2.07 ACCESSORIES

Accessories shall be manufactured from galvanized sheet steel unless otherwise indicated and shall be manufacturer’s standard products. Special shapes shall be provided where indicated.
2.08 ACCESS PANELS

A. In partitions and ceilings installed under this Section, provide doors where required for access to mechanical installations and electrical installations.

B. Types:

1. Unless otherwise required, provide 24-inch by 24-inch metal access doors with concealed hinges to metal frame, and with Allen key lock.

2. Provide prime-coated steel access doors and frames for finish painting to be performed at the job site under Division 9 of these Specifications.

2.09 WATERPROOF MEMBRANE

Waterproof membrane shall be asphaltic saturated 43 lb. (vapor-retarder) membrane conforming to ASTM D 2626 Type 1, 25 lb/100 sq ft minimum or 10-mil polyethylene film membrane.

2.10 FRAMING MEMBERS

A. Light-gauge, non-load-bearing steel framing shall comply with ASTM C645 and shall be provided wherever another system is not indicated.

B. Metal furring channels for ceilings and walls shall be galvanized steel designed for screw attachment of 5/8-inch gypsum board. The furring channel shall be not less than 7/8 inch deep and 2 3/4 inches wide.

C. Channels shall be hot-rolled or cold-rolled steel, free of rust; shall be given a coating of protective paint; and shall be of the size set forth in the CBC for the span and load imposed.

D. Tie wire or clips used for securing cross furring to primary members shall be galvanized, soft annealed steel wire. The weight of galvanizing shall be not less than Class 1 as set forth in Federal Specifications QQ-W-461. Tie wire gauge shall be as set forth in the CBC.

E. Wire hangers supporting main runners in suspended ceilings shall be galvanized steel and the weight of galvanizing shall be not less than Class 1 as set forth in Federal Specifications QQ-W-461. The gauge of galvanized steel hanger wire shall be as required under the CBC.
2.11 OTHER MATERIALS

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

2.12 MANUFACTURERS

A. Products shall be of the following type and manufacture (or equal):

1. Tile backing board: United States Gypsum's "Durock Board"; Laticrete International's "Latipanel"


3. Access Panel: Milcor "Type DW"; Boice "Type C"

PART 3 - EXECUTION

3.01 GENERAL

A. Install gypsum board as shown on the Drawings and as required to complete the work.

B. Gypsum board installation and fire-rated gypsum board construction shall conform to applicable codes, reference standards, manufacturers printed recommendations, and Gypsum Association's printed recommendations.

1. Gypsum board shall be applied first to ceiling and then to walls. Wall application shall be horizontal (right angles to framing) or vertical (parallel to framing) conforming to reference standards.

2. All gypsum board shall be screw fastened to metal framing and furring, and/or nail or screw fastened to wood framing and furring. Fastener spacing shall be per reference standards.

3. Multi-layer application shall be per reference standards indicated and manufacturer's recommendations.

4. Resilient channels and multi-layer gypsum board shall be furnished, installed and constructed where sound walls are indicated.

5. Gypsum wallboard surface finish shall be three-coat work.
6. Installation of steel framing shall be in accordance with ASTM C754 and CBC.

7. At internal and external corners, conceal the cut edges of the boards by the overlapping covered edges of the abutting boards.

8. Stagger the boards so that corners of any four boards will not meet at a common point except in vertical corners.

C. Walls:

1. Install the gypsum wallboard to stubs at right angles to the furring or framing members.

2. Make end joints, where required, over framing or furring members.

D. Attaching:

1. Drive the specified screws with clutch-controlled power screwdrivers, spacing the screws 12 inches on center at ceilings and 16 inches on center at walls.

2. Where framing members are spaced 24 inches apart on walls, space screws 12 inches on center.

3. Attach double layers in accordance with the pertinent code and the manufacturer’s recommendations as approved by the City.

4. Attach to wood as required by governmental agencies having jurisdiction.

E. Access doors/panels:

1. By careful coordination with the Drawings and with the trades involved, install the specified access doors where required. Access panels shall be installed for access to valves and equipment.

2. Anchor firmly into position and align properly to achieve an installation flush with the finished surface.

3.02 CEILING SYSTEM

A. The complete ceiling system shall meet the requirements for the rating indicated. The system shall conform to governing codes and shall meet UL requirements for the approved system.
B. Install the gypsum wallboard to ceilings with the long dimension of the wallboard at right angles to the supporting members.

C. Wallboard may be installed with the long dimension parallel to supporting members that are spaced 16 inches on centers when attachment members are provided at end joints.

D. The seismic restraint systems shall conform to code and shall be provided in all locations required by code.

1. Ceiling systems shall be provided with diagonal bracing wires. Horizontal restraints shall be four No. 23-gauge wires secured to the main beams within 2 inches of the cross tee intersection and splayed 90 degrees from each other at an angle not exceeding 45 degrees from the plane of the ceiling. These horizontal restraint points shall be placed not more than 12 feet on center in both directions with the first point within 4 feet from each wall. The restraint wire attachment to the supporting structure shall be adequate for the loads imposed. Side wall ties shall be provided where necessary.

2. Ceiling system shall be provided with a vertical restraint system to resist seismic uplift movements. The system shall be vertical metal struts attached to the main runners, and fastened, secured and anchored to the underside of the structural system above. Restraint locations shall be not less than required by code and at horizontal restraint locations.

E. Lighting fixtures, air diffusers, and other embedments shall be coordinated to provide the ceiling design and to prevent interference with the locations of the embedded items and the ceiling system.

3.03 INSTALLATION OF METAL ACCESSORIES

A. The Drawings do not purport to show all locations and requirements for metal trim.

B. Carefully study the Drawings and the installation and provide all metal trim normally recommended by the manufacturer of the gypsum wallboard approved for use in this work.

C. Metal edge trim shall be applied at all discontinued edges, where abutting with another material, and where indicated. Corner beads shall be applied at all exterior corners.

D. All metal accessories shall be set plumb, level, and true and shall be shimmed where necessary. The accessories shall be mitered at corners; exposed joints shall be accurately and tightly fitted. Sections shall be installed in lengths as long as practicable and splices shall be held to a minimum.
E. All accessories, trim, and beads shall be securely fastened to framing members.

3.04 EDGE SEALING

All cut, broken, or exposed edges of moisture-resistant gypsum board shall be sealed with a sealer recommended in the printed standards of the gypsum board manufacturer.

3.05 JOINT TREATMENT

A. General:

1. Inspect areas to be joint treated verifying that the gypsum wallboard fits snugly against supporting framework.

2. In areas where joint treatment and compound finishing will be performed, maintain a temperature of not less than 55 degrees F for 24 hours prior to commencing the treatment and until joint and finishing compounds have dried.

3. Apply the joint treatment and finishing compound by machine or hand tool.

4. Provide a minimum drying time of 24 hours between coats with additional drying time in poorly ventilated areas.

B. Embedding compounds:

1. Apply to gypsum wallboard joints and fastener heads in a thin uniform layer.

2. Spread the compound not less than 3 inches wide at joints, center the reinforcing tape in the joint, and embed the tape in the compound. Then spread a thin layer of compound over the tape.

3. After this treatment has dried, apply a second coat of embedding compound to joints and fastener heads, spread in a thin, uniform coat to not less than 6 inches wide at joints, and feather edge.

4. Sandpaper between coats as required.

5. When thoroughly dry, sandpaper to eliminate ridges and high points.
C. Finishing compounds:

1. After embedding compound is thoroughly dry and has been completely sanded, apply a coat of finishing compound to joints and fastener heads.

2. Feather the finishing compound to not less than 12 inches wide.

3. When thoroughly dry, sandpaper to obtain a uniformly smooth surface, taking care not to scuff the paper surface of the wallboard.

3.06 CORNER TREATMENT

A. Internal corners: Treat as specified for joints except fold the reinforcing tape lengthwise through the middle and fit neatly into the corner.

B. External corners:

1. Install the specified corner bead fitting neatly over the corner and securing with the same type fasteners used for installing the wallboard.

2. Space the fasteners approximately 6 inches on centers and drive through the wallboard into the framing or furring member.

3. After the corner bead has been secured into position, treat the corner with joint compound and reinforcing tape as specified for joints, feathering the joint compound out from 8 to 10 inches on each side of the corner.

3.07 SURFACE FINISH

A. All gypsum board joints shall be taped and all joints, end trim, corner beads, fastener, and other depressions shall be treated with joint and finishing compounds applied per manufacturer's printed recommendations and as specified herein.

B. The gypsum board shall be sanded smooth, dusted, and provided with a textured orange peel finish coat.

C. Gypsum board behind vinyl wall covering and wood paneling shall be left with a sanded, flush, and smooth finish surface ready for painting.

D. Gypsum board at non-visible locations, such as within attics, shall be finished as required for fire protection.

E. All exposed gypsum board shall be painted in accordance with Section 09 90 00. Color of paint shall be as selected by the City.
3.08 **ATTIC SEPARATIONS**

Gypsum board attic separations, with framing if necessary, shall be provided where shown and shall be installed and taped per CBC. Access doors shall be self-closing, and return air openings shall be equipped with fusible fire links and self-closures.

3.09 **CLEAN-UP**

A. In addition to other requirements for cleaning, use necessary care to prevent scattering gypsum wallboard scraps and dust and to prevent tracking gypsum and joint finishing compound onto floor surfaces.

B. At completion of each segment of installation in a room or space, promptly pick up and remove from the working area all scrap, debris, and surplus material of this Section.

**END OF SECTION**
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PART 1 - GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment and incidentals required for the surface preparation and application of paint systems as specified herein.

B. The following items shall be painted in accordance with this Section:
   1. Doors and door frames
   2. Downspouts
   3. Roof gutters
   4. Exposed flashing, metal boxes, and soffit
   5. Exposed galvanized pipe straps, supports, hangers, boxes, and similar items
   6. Exposed wood and plywood
   7. Gypsum board
   8. Exposed galvanized hardware
   9. Miscellaneous ferrous metal item
   10. All new surfaces, interior and exterior, that are not covered under Section 09 92 00 and Section 09 93 00

C. All colors shall be as selected by the City.

D. The following items shall not be painted:
   1. Items that are shop coated with a complete coating system.
   2. Items that are to be painted in accordance with Sections 09 92 00 and 09 93 00.
   4. Concrete that is required to be sandblasted or required to receive a clear seal coat.
   5. Masonry required to receive a clear seal coat or other surface treatment, such as stucco finish.
1.02 RELATED WORK

A. Shop Painting and Coating are included in Section 09 91 00.

B. Field painting and protective coating (for steel material) are included in Section 09 92 00.

C. Wax tape coating is included in Section 09 93 00.

1.03 DEFINITIONS

"Paint," as used herein, means coating systems materials including primers, emulsions, epoxy, enamels, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.04 SUBMITTALS

A. Submit product data:

1. Paint system schedule for each item.

2. Materials list of items proposed to be provided under this Section.

3. Manufacturer’s specifications and other data needed to prove compliance with the specified requirements.

4. Charts for colors and glosses.

B. Samples:

1. Following the selection of colors and glosses by the City, submit samples for the City’s review.

   a. Provide two samples of each color and each gloss for each material on which the finish is specified to be applied.

   b. Except as otherwise directed by the City, make samples approximately 8” x 10” in size.

2. Revise and resubmit each sample as requested until the required gloss, color, and texture are achieved. Such samples, when approved, will become standards of color and finish for accepting or rejecting the work of this Section.

C. Extra paint for maintenance and touch-up in accordance with Paragraph 3.07 of this Section.
1.05 QUALITY ASSURANCE

A. Paint coordination:

1. Provide finish coats that are compatible with the prime coats actually used.

2. Review other Sections of these Specifications as required, verifying the prime coats to be used and assuring compatibility of the total coating system for the various substrata.

3. Upon request, furnish information on the characteristics of the specific finish materials to assure that compatible prime coats are used.

4. Provide barrier coats over non-compatible primers or remove the primer and reprime as required.

1.06 SITE CONDITIONS

A. Do not apply solvent-thinned paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 7.2 degrees C (45 degrees F), unless otherwise permitted by the manufacturers’ printed instructions as approved by the City.

B. Weather conditions:

1. Do not apply paint in snow, rain, fog, or mist, or when the relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted by the manufacturer’s printed instructions as approved by the City.

2. Applications may be continued during inclement weather only within the temperature limits specified by the paint manufacturer as being suitable for use during application and drying periods.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

A. Acceptable materials:

1. The paint material shall be as per Painting Schedule in Paragraph 2.02 of this Section.
2. Equal products of other manufacturers approved in advance by the City may be substituted in accordance with provisions of the Contract.

3. Material shall be in full compliance with the requirements of pertinent codes and fire regulations.

4. No paint containing lead will be allowed. Oil shall be pure boiled linseed oil.

5. All paint shall comply with local regulations regarding the release of volatile organic compounds (VOC’s).

B. Undercoats and thinners:

1. Provide undercoat paint produced by the same manufacturer as the finish coat.

2. Use only the thinners recommended by the paint manufacturer, and use only to the recommended limits.

3. Insofar as practicable, use undercoat, finish coat, and thinner material as parts of a unified system of paint finish.

C. Delivery:

All painting materials shall be delivered in unbroken packages, bearing the manufacturer's brand and name. They shall be used without adulteration and mixed, thinned and applied in strict accordance with manufacturer's directions for the applicable materials and surfaces.

2.02 PAINT SCHEDULE

A. Metal, ferrous (including Doors and Frames):

1. First coat: Tnemec 115V Uni-Bond @ 2-4 mils DFT – shop applied/field touch-up

2. Second coat: Tnemec 115V Uni-Bond @ 2-4 mils DFT

3. Third coat: Tnemec 1029 Enduratone – semi gloss @ 2-3 mils DFT

B. Metal, galvanized:

1. Touch-up: Tnemec Hydro-Zinc @ 2.5-3.5 mils DFT

2. Second coat: Tnemec 115V Uni-Bond @ 2-4 mils DFT

3. Third coat: Tnemec 1029 Enduratone – semi gloss @ 2-3 mils DFT
C. Exterior/Exposed Wood/Plywood:

1. First coat: Vista Paint – 4200 Terminator II Primer
2. Second coat: Vista Paint – 3000 Acribond
3. Third coat: Vista Paint – 3000 Acribond

D. Exterior and interior concrete unit masonry:

Aboveground exterior and interior surfaces of masonry that are not identified to receive other treatment or coating, such as stucco, veneer, paint, or similar, shall be sprayed with two coats of Siloxane WB Concentrate 8:1(water 8 parts: Concentrate 1 part) clear block sealer as manufactured by Prosoco Inc., Tnemec 633 Prime a Pell H20, or approved equivalent.

E. Gypsum Drywalls

1. First coat: Vista Paint – 155 Seal Kote
2. Second coat: Vista Paint – 1000 Duraglide
3. Third coat: Vista Paint – 1000 Duraglide

2.03 COLOR SCHEDULES

A. The City may select, allocate, and vary colors on different surfaces throughout the work, subject to the following.

1. Exterior work: A maximum of four different colors will be used, with variations for trim, doors, miscellaneous work, and metal work.

2. Interior work: A maximum of four different pigmented colors will be used, with variations for trim and wall surfaces and wainscots.

3. Color shall be as selected by the City. All special and standard colors shall be made available at no additional cost to the City.

2.04 APPLICATION EQUIPMENT

A. For application of the approved paint, use only such equipment as is recommended for application of the particular paint by the manufacturer of the particular paint, and as approved by the City.

B. Prior to use of application equipment, verify that the proposed equipment is actually compatible with the material to be applied, and that integrity of the finish will not be jeopardized by use of the proposed equipment.
2.05 OTHER MATERIALS

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

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

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

3.02 MATERIALS PREPARATION

A. General:

1. Mix and prepare paint materials in strict accordance with the manufacturers' recommendations as approved by the City.

2. When materials are not in use, store in tightly covered containers.

3. Maintain containers used in storage, mixing, and application of paint in a clean condition, free from foreign materials and residue.

B. Stirring:

1. Stir materials before application, producing a mixture of uniform color and density.

2. Do not stir into the material any film that may form on the surface, but remove the film and, if necessary, strain the material before using.

3.03 SURFACE PREPARATION

A. General:

1. Perform preparation and cleaning procedures in strict accordance with the paint manufacturers’ recommendations as approved by the City’s Designated Representative.

2. Remove removable items that are in place and are not scheduled to receive paint finish; or provide surface applied protection prior to surface preparation and painting operations.
3. Following completion of painting in each space or area, reinstall the removed items by using workers who are skilled in the necessary trades.

4. Clean each surface to be painted prior to applying paint or surface treatment.

5. Remove oil and grease with clean cloths and cleaning solvent of low toxicity and flash point in excess of 200 degrees F, prior to start of mechanical cleaning.

6. All metal welds, imperfections, etc. shall be ground and sanded smooth. All pits and dents shall be filled and all imperfections shall be corrected to provide a smooth surface for painting. All rust, loose scale, oil, tar and asphalt bearing coatings, grease and dirt shall be removed by use of approved solvents, wire brushing, grinding or sanding.

7. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall onto wet newly painted surfaces.

B. Preparation of Wood Surfaces:

1. Clean wood surfaces until free from dirt, oil, and other foreign substance.

2. Smooth finished wood surfaces exposed to view, using the proper sandpaper. Where so required, use varying degrees of coarseness in sandpaper to produce a uniformly smooth and unmarred wood surface.

3. Do not proceed with painting of wood surfaces until the moisture content of the wood is 12% or less as measured by a moisture meter.

C. Preparation of Metal Surfaces:

1. Thoroughly clean surfaces until free from dirt, oil, rust, and grease.

2. Metal surfaces of existing components shall be prepared as per SSPC-SP1 solvent cleaning followed by SSPC-SP2 or SSPC-SP3.

3. On galvanized surfaces, use solvent for the initial cleaning and then treat the surface thoroughly with phosphoric acid etch. Remove etching solution completely before proceeding.

4. Allow surfaces to dry thoroughly before application of paint system.
D. Preparation of CMU and Concrete Surfaces:

1. Thoroughly clean surfaces until free from dirt, oil, and grease.
2. Clean all surfaces using damp cloth.
3. Allow surfaces to dry thoroughly before application of clear coat.

3.04 PAINT APPLICATION

A. General:

1. Protection of existing components and accessories shall be provided throughout the painting operation. Canopies of lighting fixtures shall be loosened and removed from contact with surface, covered and protected and reset upon completion. Remove all electric plates, surface hardware, etc., before painting. Protect and replace when completed. Mask all machinery nameplates and all machined parts not receiving a paint finish. Dripped or spattered paint shall be promptly removed. Lay drop cloths in all areas where painting is being done to adequately protect flooring and other work from all damage during the operation and until the Work is accepted.

2. Apply each coat of paint at the rate specified by the manufacturer to achieve the minimum dry mil thickness required. If material has thickened or must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material.

3. One gallon of paint as originally furnished by the manufacturer shall not cover a greater area when applied by spray gun than when applied unthinned by brush.

4. On porous surfaces, it shall be the painter's responsibility to achieve a protective and decorative finish either by decreasing the coverage rate or by applying additional coats of paint.

5. All surfaces that will become inaccessible after installation of new equipment/components shall be painted prior to installation of the equipment/components.

B. Field Priming:

1. Touchup shop-applied prime coats that have been damaged and touchup bare areas prior to start of finish coat applications.

2. Equipment that is specified to receive a baked-on enamel finish or other factory finish shall not be field painted unless the finish has been damaged in transit or during installation. Surfaces that have been shop painted and
have been damaged or where the shop coat or coats of paint have deteriorated, shall be properly cleaned and retouched before any successive painting is done on them in the field. All such field painting shall match as nearly as possible the original finish.

3. Equipment shipped with a protective shop painting coat or coats shall be touched up to the satisfaction of the City with primers as recommended by the manufacturer of the finish paint.

C. Field Painting:

1. All painting at the Site shall be designated as Field Painting and shall be under the direct and complete control of the Contractor and only skilled painters and specialists, where required, shall be used on the Work.

2. Weather Conditions:

   a. All paint shall be at room temperature before applying.

   b. Paint contractor shall record environmental conditions present during paint application to verify conformance with specifications requirements and manufacturers recommendations. Information shall include humidity, dew point, surface temperature, surface preparation, etc. Painting shall not be performed under the following conditions.

   - When the temperature is below 60 degrees F
   - In dust-laden air
   - When rain or snow is falling
   - In fog, mist or heavy wind conditions
   - When surface temperature is less than five degrees above the dew point or higher than 120 degrees F
   - When relative humidity is above 85 percent or the temperature is above 90 degrees F
   - Until all traces of moisture have completely disappeared from the surface to be painted

3. Finish surfaces shall not show brush marks or other irregularities. Undercoats shall be thoroughly and uniformly sanded with the type of paper appropriate for the undercoats to remove defects and provide a smooth even surface. Top and bottom edges of doors shall be painted.

4. Painting shall be continuous and shall be accomplished in an orderly manner to facilitate inspection. Materials subject to weather shall be prime coated as quickly as possible. Surfaces of exposed members that will be inaccessible after erection shall be cleaned and painted before erection.
5. All painting shall be performed by approved methods with number of coats modified as required to obtain the total dry film thickness specified. Spray painting shall be performed specifically by methods submitted and as approved by the Engineer.

6. All surfaces to be painted as well as the atmosphere in which painting is to be done shall be kept warm and dry by heating and ventilation, if necessary, until each coat of paint has hardened. Heating and ventilation methods used shall not cause discoloration of the finish coat. Any defective paint shall be scraped off and repainted in accordance with the City’s directions.

7. Before final acceptance of the work, all damaged surfaces of paint shall be cleaned and repainted as directed by the City.

8. Slightly vary the color of succeeding coats.

   a. Do not apply additional coats until the completed coat has been inspected and approved.

   b. Only the inspected and approved coats of paint will be considered in determining the number of coats applied.

9. Sand and dust between coats to remove defects visible to the unaided eye from a distance of five feet.

10. Drying:

    a. Allow sufficient drying time between coats, modifying the period as recommended by the material manufacturer to suit adverse weather conditions.

    b. Consider oil-base and oleo-resinous solvent-type paint as dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and when the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

11. Brush applications:

    a. Brush out and work the brush coats onto the surface in an even film.

    b. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, and other surface imperfections will not be acceptable.
12. Spray application:

   a. Except as specifically otherwise approved by the City, confine spray application to metal framework and similar surfaces where hand brushwork would be inferior.

   b. Where spray application is used, apply each coat to provide the hiding equivalent of brush coats.

   c. Do not double back with spray equipment to build up film thickness of two coats in one pass.

13. For completed work, match the approved samples as to texture, color, and coverage. Remove, refinish, or repaint work not in compliance with the specified requirements.

D. Miscellaneous Surfaces and Procedures:

1. Exposed mechanical items:

   a. Finish electric panels, access doors, conduits, pipes, ducts, grilles, registers, vents, and items of similar nature to match the adjacent wall and ceiling surfaces, or as directed.

   b. Paint visible duct surfaces behind vents, registers, and grilles flat black.

   c. Wash metal with solvent, prime, and apply two coats of paint.

2. Exposed pipe and duct insulation:

   a. Apply one coat of paint on insulation that has been sized or primed under other Sections; apply two coats on such surfaces when unprepared.

   b. Match color of adjacent surfaces.

   c. Remove band before painting, and replace after painting.

3. Hardware:

   a. Paint prime coated hardware to match adjacent surfaces.

   b. Paint metal portions of head seals, jamb seals, and astragal seals to match the color of the door frame unless otherwise directed by the City.
3.05 QUALITY CONTROL AND TESTING

A. Measure coating thickness specified for metal surfaces with a calibrated magnetic-type dry-film thickness gauge. Check each coat for the correct dry-film thickness. Do not measure within eight hours after application of the coating.

B. A minimum of five spot measurements shall be taken in a given area to assure proper coat dry film thickness. The average of these measurements shall not be less than the specified thickness. No single spot measurement shall be less than 80 percent nor more than 120 percent of the specified thickness.

C. Provide a finish applied evenly and free of laps, runs, sags, cloudiness, color irregularity, orange peel or other surface irregularities.

D. Defective coating shall be repaired and retested until it passes the tests and is approved by the City.

3.06 CLEANUP

A. At all times, keep the premises free from accumulation of waste material and rubbish caused by employees or work. At the completion of the painting, remove all tools, scaffolding, surplus materials and all rubbish from and about the buildings and leave the work "broom clean" unless more exactly specified.

B. Upon completion, remove all paint where it has been spilled, splashed, or spattered on all surfaces, including floors, fixtures, equipment, furniture, concrete pads, concrete foundations, etc. leaving the work ready for inspection.

3.07 MAINTENANCE AND EXTRA PAINT

Upon completion of the work of this Section, deliver to the City at least 2 gallons of paint of each color, type, and gloss used in the work. Extra paint shall be provided in the original unopened containers. Provide clearly marked labels on each container depicting contents and location where used at the Site.

END OF SECTION
SECTION 09 91 00

SHOP COATING

PART 1- GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required for the surface preparation and application of shop primers on exterior ferrous metals and shop coatings for mechanical items, excluding stainless steels, as specified herein.

1.02 RELATED WORK

A. Architectural Painting is included in Section 09 90 00.

B. Field Painting and Protective Coating are included in Section 09 92 00.

C. Petrolatum Tape and Petroleum Wax Tape Coatings are included in Section 09930.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01 32 19, shop drawings, manufacturer's specifications and data on the proposed primers and detailed surface preparation, application procedures and minimum dry film thicknesses. Submittals shall include at least the following:

1. Representative physical samples of the proposed primers if required by the Engineer.

2. Color charts for approval if required by the Engineer.

1.04 REFERENCE STANDARDS

A. American Water Works Association (AWWA)

1. AWWA C213 - Fusion Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines

B. National Association of Corrosion Engineers (NACE)

1. NACE SP0188 - Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
C. Society for Protective Coatings (SSPC)

1. SSPC-SP-6 - Commercial Blast Cleaning
2. SSPC-SP-10 - Near-White Blast Cleaning
3. SSPC-PA2 - Measurement of Dry Coating Thickness with Magnetic Gages

D. American Society for Testing & Materials (ASTM)

2. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

1.05 DEFINITIONS

A. Submerged exterior surfaces: Items subject to submersion, splash action, high humidity or located within vaults.

B. Non-submerged surfaces: Items not subject to submersion, splash action, high humidity or located within vaults.

C. Buried exterior surfaces: Items that are buried.

D. Submerged interior surfaces: Items that contain potable or non-potable water.

E. Non-primed surfaces: Items provided by the manufacturer not requiring coatings.

F. Special Surfaces: Items receiving special coatings, such as electrostatically applied powder coating or fusion bonded powder coating or others as specified on the Drawings and in other Sections of the Specifications.

1.06 QUALITY CONTROL AND ASSURANCE

A. All shop prime coat materials shall be compatible with the field painting and coating materials. Refer to Section 09 92 00.

B. Coordinate with the General Contractor as required for field painting and coating materials.

C. Provide a finish applied evenly, free of laps, runs, sags, cloudiness, color irregularity, orange peel or other surface irregularities.

D. No paint containing lead will be allowed. Oil shall be pure boiled linseed oil.
E. All paint shall comply with local regulations regarding the release of volatile organic compounds (VOC’s).

F. Defective coating shall be repaired and re-tested until it passes the tests and is accepted by the City.

G. Paint on interior surfaces of items conveying potable water shall conform to NSF Standard 61.

PART 2 - PRODUCTS

2.01 MATERIALS FOR NON-GALVANIZED METALS

A. Submerged Exterior Surfaces and Non-submerged Surfaces:

1. Spray apply prime coat of Tnemec Co., Inc. Pota-Pox Series L140F @ 3 to 5 mils DFT.

2. Items to receive finish coating in field shall receive shop prime coat only as specified above. Field coating shall be per Section 09 92 00.

3. For items to be furnished with a complete coating system, apply intermediate and finish coat as specified below.

   a. Apply intermediate coat of Tnemec Co., Inc. L140F Pota-Pox or L69 Epoxoline @ 2 to 4 mils DFT.

   b. Apply Finish coat of Tnemec Co., Inc. 1095 Endura-Shield @ 2-3 mils DFT.

   c. Total coating DFT shall be 7 mils minimum and 12 mils maximum.

4. Equivalent coating system from Devoe or Valspar Co.; Dupont will be acceptable.

B. Buried Exterior Surface:

1. Spray apply shop prime coat of Tnemec Co., Inc. Pota-Pox Series L140F @ 3 to 5 mils DFT.

2. All buried exterior surfaces shall be wax taped in accordance with Section 09 93 00.
C. Submerged Interior Surface

   a. Apply a chemically cured, two-part epoxy coating which is non-
      hygroscopic, non-water soluble and non-toxic. Epoxy shall conform to
      NSF Standard 61.
   b. Spray apply prime coat of Tnemec Co., Inc. Pota-Pox Series L140F @ 4
      to 5 mils DFT.
   c. Apply two coat(s) of Tnemec Co., Inc. Pota-Pox Series L140F @ 10 to
      13 mils (total mils in two coats). Alternatively, apply a finish coat of
      Series 22, or FC 22 Epoxoline @ 16 to 20 mils DFT.
   d. Total coating DFT shall be 13 mils minimum 16 mils maximum for finish
      coats with Pota-Pox Series L140. Total coating DFT shall be 19 mils
      minimum and 25 mils maximum for finish coat with Series 22, or FC 22
      Epoxoline.
   e. Equivalent coating system from Devoe Valspar Co.; Dupont will be
      acceptable.

2. System 2: As an alternative to epoxy system, fusion bonded epoxy may be
   used.
   a. Fusion bonded epoxy shall be used where specified elsewhere in the
      Contract Documents and as an alternative to liquid epoxy system.
      Fusion bonded epoxy shall conform to NSF Standard 61 and be applied
      in accordance with ANSI/AWWA C213, except that the surface
      preparation shall be as specified herein.
   b. The fusion-bonded epoxy shall be applied using the fluidized bed or
      electrostatic spray process. Coating shall be 16 mils thick, Scotchkote
      134 (electrostatic) or 206N (fluidized bed) or approved equivalent.

D. Non-Primed Exterior Surfaces - A heavy shop coat of grease or other suitable
   rust-resistant coating. This coating shall be of a quality and thickness as
   necessary to prevent corrosion during all periods of storage and erection and
   shall be satisfactory to the Engineer up to the time of the final acceptance test.

E. Special Surfaces:

1. Electrostatically applied powder coating or fusion bonded powder coating
   on equipment and pre-manufactured items will be acceptable. Such
coating system shall be provided where indicated in the Contract Documents.

2. Powder shall be polyester, polyurethane, polyester-epoxy, or epoxy.

3. Dry finish thickness of powder coating shall be a minimum of 3 to 4 mils.

4. Unless otherwise specified, color shall be black as approved by the City.

F. Compatibility of Coating Systems - Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with their corresponding primers and finish coats for use in the field and which are recommended for use together.

G. Aluminum Fabrications - Apply a coat of methacrylate lacquer before shipment.

2.02 MATERIALS FOR GALVANIZED METALS

All metals to be galvanized shall receive a coating of zinc applied by immersion in a bath of molten zinc and allowing the items to remain in the batch until their temperature becomes the same as the bath, to a coating of not less than 2 ounces per square foot of surface.

PART 3 - EXECUTION

3.01 APPLICATION

A. Surface Preparation

1. Surfaces of materials to be shop primed shall be prepared as follows:

<table>
<thead>
<tr>
<th>Materials</th>
<th>Shop Surface Preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Galvanized Metals:</td>
<td></td>
</tr>
<tr>
<td>Submerged Exterior Surfaces</td>
<td>SSPC-SP 10</td>
</tr>
<tr>
<td>Non-Submerged Surfaces</td>
<td>SSPC-SP 6</td>
</tr>
<tr>
<td>Buried Exterior Surfaces</td>
<td>SSPC-SP 10</td>
</tr>
<tr>
<td>Submerged Interior Surfaces</td>
<td>SSPC-SP 10</td>
</tr>
<tr>
<td>Non-Primed Surfaces</td>
<td>Inhibited chemicals per manufacturer’s recommendations</td>
</tr>
<tr>
<td>Galvanized Metals:</td>
<td>Thoroughly clean and roughen entire surface by abrasive blast with fine abrasive to achieve a 1.5-2.0 anchor profile.</td>
</tr>
</tbody>
</table>
2. Remove scale, rust and other deleterious material. Surfaces shall be clean, dry and free of dust, oil, grease and other foreign material prior to priming.

3. Do not sandblast or prepare more surface area in one day than can be coated in one day; prepare surfaces and apply coatings the same day.

B. Apply coatings in accordance with the recommendations of coating manufacturer.

C. Primed surfaces shall be cleaned thoroughly and damaged or bare spots prepared as approved and retouched with the specified primer before the application of successive paint coats in the field.

3.02 EVALUATION AND REPAIRS

A. Thickness Testing: Thickness of coatings and paints shall be tested with a non-destructive film thickness gauge. An instrument such as a Tooke Gauge should be used if a destructive tester is deemed necessary. Testing shall be accomplished in conformance to SSPC-PA2, “Procedure for Determining Conformance to Dry Coating Thickness Requirements.”

B. Holiday Testing: Coating integrity of all interior coated surfaces shall be tested with an approved testing device. All pinholes shall be marked and repaired. No pinholes or other irregularities will be permitted in the final coating.

C. When required by AWWA C210, C213 or C222, adhesion testing shall be performed in accordance with ASTM D4541 for shop coated surfaces.

D. All deficiencies found in coatings and paints shall be repaired in accordance with the manufacturer's printed recommendations.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all materials, labor, equipment and incidentals required and apply field painting and coating to complete this Contract in its entirety as specified herein.

B. The following items shall be painted in accordance with this Section:

- Pipe, fittings, and appurtenances
- Structural steel, tubing, railing
- Miscellaneous ferrous metal items
- Shop prime coated equipment/items
- Exposed PVC piping
- Field touch up of damaged shop coating
- Items that are not painted under Section 09 90 00

1.02 RELATED WORK

A. Waterproofing is included in Section 07 90 00.

B. Architectural Painting is included in Section 09 90 00.

C. Surface Preparation and Shop Painting and Coating are included in Section 09 91 00.

D. Petrolatum Tape and Petroleum Wax Tape Coatings are included in Section 09 93 00.

1.03 REFERENCE SPECIFICATIONS AND STANDARDS

A. The work shall conform to all applicable requirements of federal, state, municipal, and local agency regulations, codes, laws, and rules. Errors or omissions of any law or regulation from this specification shall not relieve the Contractor from complying with any law or regulation necessary for performing the work.

B. American Society for Testing and Materials

1. ASTM D16 – Standard Terminology for Paint, Related Coatings, Materials, and Applications
2. ASTM D3359 – Standard Test Methods for Rating Adhesion by Tape Test


4. ASTM D4285 – Standard Test Method for Indicating Oil or Water in Compressed Air

5. ASTM D4414 – Standard Practice for Measurement of Wet Film Thickness by Notch Gages


C. National Association of Corrosion Engineers (NACE)

1. SP0188 – Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

D. The Society for Protective Coatings (SSPC)

1. SSPC-PA 1, Shop, Field and Maintenance Coating of Metals

2. SSPC-PA 2, Procedure for Determining Conformance to Dry Coatings Thickness

3. SSPC-PA, Guide 10, Guide to Safety and Health Requirements

4. SSPC-SP 1, Solvent Cleaning

5. SSPC-SP 2, Hand Tool Cleaning

6. SSPC-SP 3, Power Tool Cleaning

7. SSPC-SP 6, Commercial Blast Cleaning

8. SSPC-SP 7, Brush-Off Blast Cleaning

9. SSPC-SP 10, Near-White Blast Cleaning

10. SSPC-SP 11, Bare Metal Power Tool Cleaning

11. SSPC-VIS 1, Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
E. Manufacturer’s printed instructions, recommendations and Material Safety Data Sheets (MSDS).

1.04 SUBMITTALS

A. Coating Materials and Schedule:
   1. Coating manufacturer’s name, qualifications, and experience.
   2. Coating material data, technical information, and MSDS.
   3. Paint manufacturer's instructions and recommendations on surface preparation and application.
   4. Product and MSDS data for thinners, solvents and cleaning fluids if used.
   5. Detailed coating systems schedule. At a minimum, the schedule shall include coating material, thickness, and color for each coat, total number of coats, total thickness of the coating system for each type of surface, and the method of holiday testing.

B. Material data and procedures to be used for surface preparation.

C. Coating application procedures.

D. Manufacturer’s color charts for selection of colors by the City.

E. Two sets of 8-inch by 8-inch samples of all colors required for all types of paint. Include special colors as required. Resubmit until accepted.

F. Coating applicator firm’s name, qualifications, license, and experience information.

G. Coating test records.

1.05 QUALIFICATIONS AND EXPERIENCE

A. Coating Manufacturer’s Qualifications:
   1. Coating manufacturer shall specialize in the manufacture of coatings with a minimum of 10 years’ successful experience.

B. Applicator’s Qualifications:
   1. Coating applicator/contractor shall possess a Class C-33 license in the State of California.
2. Applicator shall have a minimum of five (5) years’ practical experience and successful history in the application of similar coating products.
1.06 QUALITY ASSURANCE

A. Quality assurance procedures and practices shall be utilized to monitor all phases of surface preparation, application and inspection throughout the duration of the project. Procedures or practices not specifically defined herein may be utilized, provided they meet recognized and acceptable professional standards and are approved by the City.

1. All materials furnished and all work accomplished under the Contract shall be subject to inspection by the City. The Contractor shall be held strictly to the true intent of the Specifications concerning quality of materials, workmanship, and diligent execution of the Contract.

2. Thickness Testing: Thickness of coatings and paints shall be tested by the Contractor with a non-destructive film thickness gauge. An instrument such as a Tooke Gage should be used if a destructive tester is deemed necessary. Testing shall be accomplished in conformance to SSPC-PA 2, "Procedure for Determining Conformance to Dry Coatings Thickness" except as modified herein.

3. Holiday Testing: Coated surfaces shall be holiday tested by the Contractor with an approved inspection device and in accordance with NACE SP0188. Testing shall be performed in the presence of the City. All holidays shall be marked, repaired in accordance with the manufacturer's printed recommendations and retested. The final coating shall be 100% holiday free with no pinholes or other irregularities.

4. Inspection Devices: The Contractor shall furnish, until final acceptance of coatings and paints, inspection devices in good working condition for detection of holidays and measurement of dry-film thickness. The Contractor shall also furnish U.S. Department of Commerce, National Bureau of Standards certified thickness calibration plates to test accuracy of thickness gauges. Dry film thickness gauges and holiday detectors shall be available at all times until final acceptance of application. Inspection devices shall be operated by or in the presence of the City with location and frequency basis determined by the City. The City is not precluded from furnishing its own inspection devices and rendering decisions based solely upon results of tests using those devices.

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials to the Site in manufacturer's original, unopened containers and packaging, with labels clearly identifying:

1. Coating or material name
2. Manufacturer

3. Color name and number

4. Batch or lot number

5. Date of manufacture

6. Mixing and thinning instructions

B. Storage:

1. Store materials in a clean, dry area and within temperature range in accordance with manufacturer's instructions.

2. Keep containers sealed until ready for use.

3. Do not use materials beyond manufacturer’s shelf life limits.

C. Handling: Protect materials during handling and application to prevent damage or contamination.

1.08 DEFINITIONS

A. Submerged exterior surfaces: Items subject to submersion, splash action, high humidity or located within vaults.

B. Non-submerged surfaces: Items not subject to submersion, splash action, high humidity or located within vaults.

C. Buried exterior surfaces: Items that are buried.

D. Submerged interior surfaces: Items that contain potable or non-potable water.

E. Non-primed surfaces: Items provided by the manufacturer not requiring coatings.

F. Special Surfaces: Shop applied special coatings, such as electrostatically applied powder coating or fusion bonded powder coating, baked-enamel, or others as specified on the Drawings and other Sections of the Specifications.
PART 2 - PRODUCTS

2.01 COATING MATERIALS - GENERAL

A. All painting materials shall be by the Tnemec Company, Inc.; Valspar Co.; Dupont; DeVoe or approved equal. The painting schedule has been prepared based on Tnemec products (unless otherwise noted) and Tnemec recommendations for application.

B. All coating materials shall be brought to the Site in the original sealed containers. They shall not be opened or used until the City has physically inspected contents and obtained necessary data from information printed on containers or label. Materials exceeding storage life recommended by the manufacturer shall be rejected.

C. Contractor shall use products of same manufacturer for all coats. Each coat shall be of contrasting color as approved by the City.

D. All coating materials shall comply with air pollution regulations, specifically rules of the local air pollution control district.

E. All coating materials shall conform to regulations and applicable requirements of local, state and federal health regulatory agencies.

F. No paint containing lead will be allowed. Oil shall be pure boiled linseed oil

G. Color of all coating materials shall be as selected by the City. All standard and special color shall be made available to the City at no additional cost.

H. Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with the finish paints to be used. Refer to Section 09 91 00.

I. Materials shall be in full compliance with the requirements of pertinent codes and fire regulations. Proper containers shall be provided outside of the buildings and used for painting wastes. No sanitary or storm sewers shall be used for this purpose.

J. Paint on interior surfaces of items conveying potable water shall conform to NSF Standard 61.

K. Contractor shall supply to the City 2 gallons of touch-up paint of each kind used for the project in an unopened can.

2.02 COLOR SELECTIONS
A. Structural steel shall be gray unless otherwise approved.

B. All cabinets shall be light gray.

C. Guard post shall be school bus yellow.

D. Colors for other items shall be as approved by the City.

E. All final colors shall be selected by the City.

2.03 PAINTING SCHEDULE

A. The following surfaces shall have the types of paint and protective coating scheduled below:

1. Submerged exterior and non-submerged ferrous surfaces (exposed/outside building, inside vaults)
   a. 1 prime coat Series L140F @ 3.0-5.0 mils DFT on properly prepared unprimed metal or touch-up (Prepare surface per SSPC-SP6 Commercial Blast Clean)
   b. 1 coat Series L140F or L69 Epoxoline @ 2.0-4.0 mils DFT
   c. 1 coat Series 1095 Endura-Shield @ 2-3 mils DFT
   d. Total coating DFT shall be 7 mils minimum and 12 mils maximum.

2. Interior (inside buildings) non-submerged ferrous metals
   a. 1 prime coat Series L140F @ 3.0-5.0 mils DFT on properly prepared unprimed metal or touch-up (Prepare surface per SSPC-SP6 Commercial Blast Clean)
   b. 1 coat Series L140F or L69 Epoxoline @ 2.0-4.0 mils DFT
   c. 1 coat Series 1095 Endura-Shield @ 2-3 mils DFT
   d. Total coating DFT shall be 7 mils minimum and 12 mils maximum

3. Buried exterior surfaces of ferrous metals, including valve bodies, meters, couplings, flanges, blind flanges, pipes, nuts and bolts
   a. Petrolatum or petroleum wax tape coating in accordance with Section 09 93 00
4. Guard posts shall be painted using premium enamel with yellow school bus color. Paint shall be Plastikote Enamel PTK-T29 or approved equal.

5. Exposed plastic piping and components (abrade before painting)
   a. 2 coats Series 1029 Enduratone @ 2.0 to 3.0 mils DFT each

6. Interior walls and ceilings of below-grade concrete vault and manway shaft
   a. None

7. Exterior surfaces of below grade concrete and masonry structures
   a. In accordance with Section 07 90 00

8. Below grade concrete and masonry walls
   a. In accordance with Section 07 90 00

9. Aboveground exterior and interior surfaces of masonry that are not identified to receive other treatment or coating, such as stucco, veneer, or similar, shall be sprayed with two coats of Siloxane WB Concentrate 8:1(water 8 parts: Concentrate 1 part) clear block sealer as manufactured by Prosoco Inc., Tnemec 633 Prime a Pell H20, or approved equivalent.

10. Pipes within underground structures and inside the building that are not mortar coated shall be painted in accordance with the requirements of this Section.

11. All damaged paint on items with a complete shop-applied paint system shall be repaired using the same topcoat material as used for the original paint system unless otherwise approved in writing by the Engineer.

12. Galvanized sheet metal, piping, hardware and miscellaneous material shall be painted per Section 09 90 00.

2.04 ACCESSORIES, EQUIPMENT, AND MISCELLANEOUS MATERIALS

A. Accessories required for application of specified coatings shall be in accordance with manufacturer’s instructions.

B. Thinners, cleaners, solvents, and similar materials required for coating systems shall be in accordance with manufacturer’s recommendations.

C. Contractor shall provide materials and equipment required for protecting existing facilities and surfaces that are not to be coated.
D. Contractor shall provide materials and equipment required in accordance with safety requirements.

E. Contractor shall provide materials and equipment required for preparation of steel surfaces.

F. Contractor shall provide testing and inspection devices.

**PART 3 - EXECUTION**

**3.01 PROTECTION OF FACILITIES**

A. Protect surrounding facilities, areas, and surfaces not scheduled to be coated from damage during surface preparation and application of coatings.

B. Install sheets, blankets, or other acceptable coverings to protect the existing facilities and surfaces not scheduled to be coated.

C. Contractor shall tightly seal any vents, pumps, motors, equipment, and other open areas to prevent intrusion of paint or other contaminants. The sealing system shall be designed to allow continuous operation of facilities or equipment, with no detrimental effects.

D. Coating operation shall not begin until proper protection of the existing facilities has been performed.

E. Immediately remove coatings that fall on surrounding facilities, areas, and surfaces not scheduled to be coated.

F. The Contractor shall take all precautions necessary to prevent adverse off-site consequences of his operations. Any complaints received or evidence gathered relating to any such potential off-site problems will cause the City to stop the work. The Contractor shall immediately halt work and shall take whatever corrective action is required to mitigate any such problems. All costs associated with protection of off-site properties and/or correction of damage to property as a result of blast cleaning, coating application, or other operations shall be borne directly by the Contractor at no additional expense to the City.

**3.02 ENVIRONMENTAL REQUIREMENTS**

A. General: The Contractor shall strictly adhere to manufacturer’s instructions for environmental requirements for the applications of coatings and as supplemented below. In case of conflicts, the most stringent requirements as determined by the City shall govern.
B. Weather:

1. Do not paint in the rain, wind, snow, mist, and fog or when steel or metal surface temperatures are less than five degrees F above the dew point.

2. Do not apply paint when the relative humidity is above 80 percent or the temperature is above 90 degrees F.

3. Do not paint when temperature of metal to be painted is above 125 degrees F.

4. Do not apply alkyd or inorganic zinc paints if air or surface temperature is below 40 degrees F or expected to be below 40 degrees F within 24 hours.

5. Do not apply epoxy and polyurethane paints on an exterior or interior surface if air or surface temperature is below 50 degrees F or expected to drop below 50 degrees F in 24 hours.

6. No coating shall be applied under the following conditions:
   a. When the surrounding air temperature or the temperature of the surface to be coated or painted is below 50 degrees F or anticipated to be below 50 degrees F within 24 hours.
   b. Below 50 degrees F or above 125 degrees F for all materials, unless approved by the City, or when it is expected the air temperature will be less than 5 degrees F above the dew point within two hours after application of coatings or paints.
      i) Dew point shall be measured by use of an instrument such as a sling psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychrometric Tables or equivalent. If dehumidification is used, equipment must run continuously during all phases of contract.
   c. Forced ventilation heat curing shall not be allowed unless approved by the Engineer in writing.
      i) Contractor shall submit a procedure for forced ventilation heat curing to the Engineer, for acceptance, prior to performing this method of curing.
   d. When wind velocity exceeds fifteen miles per hour do not apply spray-applied coating.

7. If above conditions are prevalent, coating and paint application shall be
delayed or postponed until conditions are favorable. The day's application shall be completed in time to permit the film sufficient drying time prior to damage by atmospheric conditions.

C. Dust and Contaminants:

1. Schedule coating work to avoid excessive dust and airborne contaminants.

2. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

D. Dewpoint, humidity, temperature, wind velocity shall be measured by use of acceptable devices and as required. All devices to be used for measurements shall be calibrated within six months of the scheduled use.

3.03 PREPARATION OF SURFACES

A. All surfaces to be painted shall be prepared per the manufacturer’s recommendations and as modified and supplemented herein.

B. All metal welds, imperfections, etc. shall be ground and sanded smooth. All pits and dents shall be filled and all imperfections shall be corrected to provide a smooth surface for painting.

C. All rust, loose scale, oil, tar and asphalt bearing coatings, grease and dirt shall be removed by use of approved solvents, wire brushing, grinding or sanding.

D. Surfaces shall have all oxidation and foreign material removed before painting in accordance with SSPC SP-1, using an approved VOC compliant method.

E. Because of the presence of moisture and possible contaminants in atmosphere, care shall be taken to ensure previously coated or painted surfaces are protected or recleaned prior to application of subsequent coat(s). Methods of protection and recleaning shall be in accordance with manufacturer’s recommendations and as approved by the City.

F. Epoxy coated surfaces or other multi-component materials exposed to excessive sunlight or an excessive time element beyond manufacturer's recommended recoat cycle shall be scarified to achieve mechanical bond with new coat to be applied. Scarification of surfaces shall be performed using Hand Tool Cleaning method per SSPC SP-2 or Brush-Off Blast Cleaning method per SSPC SP-7. Scarified coating shall have sufficient profile to assure a mechanical bond of subsequent coat, as recommended by the manufacturer, but not less than 1 mil uniform surface profile.

G. Where field welding of galvanized material is necessary, welds shall be wire brushed clean and immediately regalvanized in the field using galvanizing
compound or coating. Materials shall comply with local regulations controlling use of volatile organic compounds.

H. Surfaces shall be dry and clean before painting.

I. Preparation for surfaces receiving petrolatum or petroleum wax tape coating system shall be in accordance with Section 09 93 00.

J. Preparation for surfaces that are shop coated with special coatings and receiving field repair paint shall be in accordance with the requirements of manufacturer of special coating.

K. All PVC pipe and other plastic matrix surfaces to be painted shall be lightly sanded and cleaned of residue before painting.

L. Do not sandblast or prepare more surface area in one day than can be coated in one day; prepare surfaces and apply coatings the same day. Do not sandblast plastic piping or equipment. Do not sandblast item that has already been factory coated with a complete coating system, except to repair scratched or damaged coatings.

3.04 APPLICATION AND WORKMANSHIP

A. General:

1. At the request of the City, samples of the finished work prepared in strict accordance with this Section shall be furnished and all painting shall be equal in quality to the approved samples. Finished areas shall be adequate for determining the quality of workmanship. Experimentation with color tints shall be furnished to the satisfaction of the City where standard chart colors are not satisfactory.

2. Protection of furniture and other movable objects, equipment, fittings, concrete pads and foundations, and accessories shall be provided throughout the painting operation. Canopies of lighting fixtures shall be loosened and removed from contact with surface, covered and protected and reset upon completion. Remove all electric plates, surface hardware, etc. before painting. Protect and replace when completed. Mask all machinery nameplates and all machined parts not receiving a paint finish. Dripped or spattered paint shall be promptly removed. Lay drop cloths in all areas where painting is being done to protect adequately flooring and other work from all damage during the operation and until the Work is accepted.

3. All work shall be accomplished by skilled craftsmen qualified to accomplish the required work in a manner comparable with the best standards of practice.
4. Paint Mixing:

a. Prepare multiple-component coatings using all of the contents of the container for each component as packaged by the paint manufacturer. Do not use partial batches. Do not use multiple-component coatings that have been mixed beyond their pot life. Provide small quantity kits for touch-up painting and for painting other small areas. Mix only the components specified and furnished by the paint manufacturer. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.

b. All coating components shall be mixed in exact proportions specified by the manufacturer. Care shall be exercised to ensure all material is removed from containers during mixing and metering operations. All coatings shall be thoroughly mixed, utilizing an approved slow-speed power mixer until all components are thoroughly combined and are of a smooth consistency. Coatings shall not be applied beyond pot-life limits or recoat cycles specified by manufacturer.

c. Thinners shall be added to coating materials only as required in accordance with manufacturer's printed literature and in the presence of the NACE CIP Level III Coatings Inspector. Quantities of thinner shall not exceed limits set by applicable regulatory agencies. If Contractor applies any materials which have been modified or thinned to such a degree as to cause them to exceed established VOC levels, Contractor shall be responsible for any fines, costs, remedies, or legal action and costs that may result.

5. Equipment:

a. All application equipment shall be designed for application of specified materials and shall be maintained in first class working condition.

b. Compressors shall have suitable traps and filters to remove water and oils from the air.

6. On metal surfaces, apply each coat of paint at the rate specified by the manufacturer to achieve the minimum dry mil thickness required. If material has thickened or must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material. One gallon of paint as originally furnished by the manufacturer shall not cover a greater area when applied by spray gun than when applied unthinned by brush. Deficiencies in film thickness shall be corrected by the application of an additional coat(s). On porous surfaces, it shall be the painter's responsibility to achieve a protective and decorative finish either by decreasing the coverage rate or by applying additional coats of paint.
B. Field Priming:

1. All piping and other metals not shop primed and delivered to the field may be sent back to the shop for shop priming at the discretion of the City. Items allowed to be field primed shall receive the same surface preparation and prime coat per Section 09 91 00.

2. Equipment shipped with protective shop painted coat or coats shall be touched up to the satisfaction of the City with primers as recommended by the manufacturer of the finish paint.

C. Field Painting:

1. All materials shall be applied as specified herein.

2. Application of the first coat shall follow immediately after surface preparation and cleaning within an eight-hour working day. Any cleaned areas not receiving first coat within an eight-hour period shall be recleaned prior to application of first coat.

3. Successive coats of paint shall be tinted to make each coat easily distinguishable from each other with the final undercoat tinted to the approximate shade of the finished coat.

4. All painting shall be performed by approved methods with number of coats modified as required to obtain the total dry film thickness specified. Spray painting shall be performed specifically by methods submitted and as accepted by the Engineer. Care shall be exercised to ensure dry-film thickness of coatings and paints does not exceed the maximum thickness allowed by the manufacturer of the specific product being applied.

5. Painting shall be continuous and accomplished in an orderly manner to facilitate inspection. Materials subject to weather shall be prime coated as quickly as possible. Surfaces of exposed members that will be inaccessible after erection shall be cleaned and painted before erection.

6. All surfaces to be painted as well as the atmosphere in which painting is to be done shall be kept warm and dry by heating and ventilation, if necessary, until each coat of paint has hardened. Heating and ventilation methods used shall not cause discoloration of the finish coat. Any defective paint shall be scraped off and repainted in accordance with the City’s directions.

7. Finish surfaces shall not show brush marks or other irregularities. Undercoats shall be sanded thoroughly and uniformly with the type of paper appropriate for the undercoats to remove defects and provide a smooth even surface. Top and bottom edges of doors shall be painted.
8. When required by AWWA C210, C213 or C222, adhesion testing shall be performed in accordance with ASTM D4541 for field painted surfaces.

9. Items that are specified to receive special coatings, such as electrostatically applied powder coating or fusion bonded powder coating shall not be field painted unless the finish has been damaged in transit or during installation. Coating repair shall be performed in accordance with Paragraph 3.05.

10. Before final acceptance of the Work, all damaged surfaces of paint shall be cleaned and repainted as directed by the City.

3.05 REPAIR SHOP APPLIED COATING SYSTEM

A. If shop applied complete coating system is damaged during transit or installation, it shall be repaired in field. This includes special coatings, such as electrostatically applied powder coating, fusion bonded powder coating, baked-enamel, or other special coatings.

B. Repair shall be performed in accordance with written recommendations of the coating material manufacturer, including removal of damaged coating, cleaning and preparation of surfaces, applying primer, and applying touch-up coating.

C. Finished color shall match existing coating system.

3.06 TESTING

A. Applied coating systems shall be tested after the finishing or final coats have cured. The Contractor’s qualified personnel shall conduct the tests for determining DFT and porosity and holiday imperfections of the coating in accordance with NACE SP0188.

B. Measure coating thickness specified for metal surfaces with a calibrated magnetic-type dry-film thickness gauge. Check each coat for the correct dry-film thickness. Do not measure until a minimum of eight hours after application of the coating.

C. A minimum of five spot measurements shall be taken in a given area to assure proper coat dry film thickness. The average of these measurements shall not be less than the specified thickness. No single spot measurement shall be less than 80 percent nor more than 120 percent of the specified thickness.

D. Provide a finish applied evenly, free of laps, runs, sags, cloudiness, color irregularity, orange peel or other surface irregularities.

E. Defective coating shall be repaired and retested until it passes the tests and is approved by the City.
3.07 CLEANUP

A. At all times keep the premises free from accumulation of waste material and rubbish caused by employees or work. At the completion of the painting, remove all tools, scaffolding, surplus materials and all rubbish from and about the buildings and leave the work broom clean unless more exactly specified.

B. Upon completion, remove all paint where it has been spilled, splashed, or spattered on all surfaces, including floors, fixtures, equipment, furniture, concrete pads, concrete foundations, etc. leaving the work ready for inspection.

END OF SECTION
SECTION 09 93 00

PETROLATUM TAPE AND PETROLEUM WAX TAPE COATINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and incidentals required and install petrolatum tape and petroleum wax tape as specified in the Contract Documents.

B. All buried ferrous materials shall receive tape coating system in accordance with this Section unless otherwise noted or material is mortar coated or concrete encased.

1.02 RELATED WORK

A. Small Valves and Pipes are included in Section 02 64 20.

B. Pipe Appurtenances are included in Section 02 64 40.

C. Shop Coating is included in Section 09 91 00.

D. Field Painting and Protective Coating are included in Section 09 92 00.

E. Equipment is included in Division 11.

1.03 SUBMITTALS

A. Submit the following to the Engineer in accordance with Section 01 32 19:

1. Detailed information for primer and tape system, including names of manufacturer and supplier, physical properties, application method, thicknesses and MSDS.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)


2. ASTM D92 – Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester


5. ASTM D937 – Standard Test Method for Cone Penetration of Petrolatum

6. ASTM D1000 – Standard Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications


B. American Water Works Association (AWWA)

1. AWWA C217 – Standard for Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings for Steel Water Pipelines

C. Society for Protective Coatings (SSPC)

1. SSPC-SP 1 - Surface Preparation Specification No. 1, Solvent Cleaning
2. SSPC-SP 2 - Surface Preparation Specification No. 2, Hand Tool Cleaning
3. SSPC-SP 6 - Surface Preparation Specification No. 6/NACE No. 3, Commercial Blast Cleaning

1.05 MARKING

Containers shall be plainly marked with the name of the manufacturer, type of material, batch or lot number, date of manufacture, and information as required by federal, state, or local laws.

1.06 PACKAGING, DELIVERY, HANDLING AND STORAGE

A. Packaging:

1. All primers and tape coatings shall be packaged in containers that ensure acceptance, safe delivery to their destination, and protection while in storage. All primers and tapes shall be stored in the original packaging until the time of use.

2. Individual sheet, pad, or roll of tape shall be packaged to prevent it from adhering to the packaging material or the container.
3. Multiple sheets, pads, or rolls shall be protected from adhering to other sheets, pads, or rolls of tape coating, the container, or to the packaging material by using separators.

4. Primer shall be packaged in pails or other containers that comply with the applicable federal, state, or local regulations.

B. Delivery: Deliver materials to the Site in original, unopened packages.

C. Handling and Storage: Materials shall be handled, stored and shipped in accordance with manufacturer’s recommendations and in a manner that causes no damage to materials.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Coating System: The tape coating system shall be a petrolatum primer and a cold-applied petrolatum tape or a petroleum wax primer and a cold-applied petroleum wax tape. Petrolatum and petroleum wax tapes shall be protected by a protective wrap.

B. Primer: The primer shall be a compound of petrolatum or petroleum wax and may contain suitable inhibitors. The primer used shall be supplied by the tape manufacturer and conform to the requirements of AWWA C 217. The primer shall protect the metal surface before application of the tape and promote adhesion of the tape to the surface.

C. Tape Coating: The tape coating shall be a saturant tape made from either petrolatum or petroleum wax and a noncellulosic synthetic fiber fabric. The fabric shall be encapsulated and coated on both sides with the petrolatum or petroleum wax. Inert materials may be added to improve applications and thermal extenders may be added for temperature resistance. Physical properties of tape coating shall conform to the requirements of AWWA C217. Thickness of tape shall not be less than 40 mils.

D. Protective Wrap: Protective wrap shall be 20 mils thick, minimum, polyvinyl chloride wrap or 40 mils-thick tape as specified in Paragraph 2.01.C.
PART 3 - EXECUTION

3.01 INSTALLATION

A. All buried ferrous materials shall receive tape coating system in accordance with this Section unless otherwise noted or material is mortar coated or concrete encased.

B. Surface Preparation

1. Bare Surfaces: Bare surfaces shall be free from dirt, loose rust, loose mill scale, loose coating, and other detrimental foreign matter. If moisture is present, wipe the surface free from moisture. Welds shall be cleaned of all welding slag, spatter, and scale and shall be allowed to cool before the coating is applied. Sharp edges or burrs that could puncture or cut the tape shall be removed by grinding or filing.

2. Primed Surfaces: Primed surfaces shall be prepared in accordance with the petrolatum or petroleum wax tape manufacturer in addition to the surface preparation as specified in Paragraph 3.01.B.1.

3. Surface Cleaning: Unless otherwise specified, all metal surfaces shall be blast-cleaned to achieve a surface preparation equivalent to SSPC-SP 6/NACE No. 3. Surfaces that have been blast-cleaned in a shop or that have been shop-coated or that are in good condition before shipment to a field location may be field-cleaned by wire brushing to achieve an SSPC-SP 2 surface preparation immediately before applying the primer and tape. If oil or grease is present, a solvent conforming to SSPC-SP 1 shall be used before wire brushing.

C. Primer Application: Primer shall be applied by brush, hand, glove, or roller. A uniform and continuous coat shall be firmly pressed onto the surface. The film thickness of the primer shall be at least 3 mils. Drying or curing of the primer will not be required unless otherwise required by the manufacturer. Application of tape shall begin immediately after the primer is applied.

D. Tape Coating and Wrapping: The tape coating system shall be applied as recommended by the manufacturer and shall not exhibit defects, such as folds and bridging. The total thickness applied shall not be less than 40 mils using a minimum overlap of 1 inch.

E. Protective Wrap Installation: The protective wrap shall be applied over the tape coating. The protective wrap shall be installed and secured in place as recommended by the manufacturer and shall not exhibit defects, such as folds and bridging. The total thickness applied shall conform to Paragraph 2.01 D using a minimum overlap of 1 inch.
F. Coating Protection:

1. Precautions to prevent damage to the tape coating shall be used at all times during construction. No metal tools or heavy objects shall come in contact with the finished tape coating. Walking on the coated component shall be avoided to prevent damage to the tape coating. Any damage to the tape coating from any cause during installation shall be repaired.

2. An 18 inch-wide strip of heat-resistant material shall be draped over the coated component on each side of the weld area during welding to avoid damage to the coating by hot weld spatter. No welding ground shall be made on the coated part of the pipe, fitting or valve, unless otherwise shown.

3. Trenches shall be backfilled in a way that prevents abrasion or other damage to the tape coating.

4. Rodding with metal rods or other metal tools that could come in contact with and damage the tape coating will not be permitted for bedding and backfill.

3.02 INSPECTION

A. Installation of primer shall not commence prior to completion of inspection of surfaces by the City.

B. Backfill shall be placed around the exterior of the tape coated pipe, fittings and valves only after the final inspection has been made and the exterior coating has been approved.

C. If tape coating system does not meet the requirement of these Specifications, it will be rejected. The damaged coating shall be repaired as specified herein.

D. Upon completion of the tape wrap or when applicable, perform holiday testing of the completed system in accordance with NACE SP0188 requirements.

3.03 REPAIR

All damage, holidays, or unsatisfactory laps shall be repaired by removing any frayed or damaged tape and any contaminants at the affected area. Primer shall be applied to the area, followed by the application of additional tape coating to cover the area completely. Each repair shall begin and end on sound, undamaged tape coating.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install acoustical metal louvers and accessories as shown on the Drawings and as specified herein.

B. Unless otherwise specified, all louvers shall be acoustical type.

1.02 RELATED WORK

A. Grout is included in Section 03 60 00.

B. Reinforced Concrete Block Masonry is included in Section 04 22 00.

C. Metal Work - General Provisions are included in Section 05 50 00.

D. Sealants and Caulking are included in Section 07 92 00.

1.03 SUBMITTALS

A. Submit the following to the Engineer in accordance with Section 01 32 19:

1. List of materials to be furnished.

2. Shop drawings and product data showing plan, elevations, sections, and spacing of louver blades. Show unit dimensions related to wall openings and construction; free area for each size indicated; profile of frames at jambs, heads, and sills; and anchorage details and locations; insect screen frame; air filter frame; and other pertinent data.

3. Required rough opening size.


5. Manufacturer’s recommended installation procedures.

6. Color charts.
7. Product Certificates and Test Reports:

   a. Air Performance:  Certificates and test report by Air Movement and Control Association International Inc. (AMCA) certifying that the products are in accordance with AMCA Standard 500 demonstrating compliance with the requirements and are licensed to bear the AMCA Certified Ratings Seal in accordance with AMCA Standard 511.

   b. Weather Louver Effectiveness:  Certificates and test report by Building Services Research and Information Association (BSRIA) certifying that the products are tested in accordance with HEVAC Technical Specification demonstrating compliance with the requirements and that performance ratings are certified by BSRIA.

   c. Airborne Sound Transmission Loss ratings according to ASTM E90.

8. Operation and Maintenance data in accordance with Section 01 32 19.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

   1. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

   2. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable


B. American Architectural Manufacturers Association (AAMA)

   1. AAMA Specification 611 - Voluntary Specification for Anodized Architectural Aluminum
C. Air Movement and Control Association, Inc. (AMCA)

1. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating

1.05 QUALITY ASSURANCE

A. Structural Performance: Provide exterior metal louvers capable of withstanding the effects of loads stress from wind and normal thermal movement without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter; or permanent damage to fasteners anchors.

1. Wind load: Uniform pressure of 20 lb./sq. ft., acting inward or outward.

2. Thermal Movements: Provide louvers that allow for thermal movements resulting from the 180-degree Fahrenheit maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, and other detrimental effects.

3. Seismic load: Louvers, including attachments to other construction, shall withstand seismic effects determined by ASCE-7.

B. Acoustic Performance, Water-Penetration and Air Leakage Ratings:

1. Provide louvers complying with performance requirements indicated, as demonstrated by testing unit not less than 48" wide and 48" high. Test shall be according to AMCA 500 and performed in shop or accredited laboratory.

a. Perform test on unpainted, cleaned, degreased units.

b. Perform water penetration testing on louvers without screens.

C. Airborne Sound Transmission Loss: Provide acoustical louvers complying with airborne sound transmission loss ratings according to ASTM E90.

1. Acoustic Louvers shall have minimum of following:

<table>
<thead>
<tr>
<th>Octave Band, HZ</th>
<th>125</th>
<th>250</th>
<th>500</th>
<th>1K</th>
<th>2K</th>
<th>4K</th>
<th>8K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free Field Noise Reduction</td>
<td>13</td>
<td>12</td>
<td>17</td>
<td>25</td>
<td>36</td>
<td>25</td>
<td>15</td>
</tr>
</tbody>
</table>

D. Aerodynamic Performance:

1. Static pressure loss of louvers shall not exceed 0.1 of w. g. at a face velocity of 1000 fpm. Airflow measurements shall be made in accordance with applicable portions of ASME, AMCA, and ADC airflow test codes. Test shall be reported on the identical units for which acoustic data is presented.
1.06 DELIVERY AND HANDLING

A. Marking:

1. Product shall bear identification markings that will remain legible during normal handling and storage. The marking shall be printed indelibly in ink or molded thereon in a manner that will not damage the product.

B. Delivery, Handling, and Storing:

1. All equipment, accessories, spares and fittings shall be prepared for standard commercial shipment unless otherwise specified.

2. Care shall be taken in loading, transporting, and unloading to prevent damage to the product. Handling shall be according to manufacturer’s recommendations.

PART 2 - PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

A. The size and dimensions shall be as shown on the Drawings.

B. Louvers shall be acoustical louvers Type T9112 as manufactured by the Airolite Company or approved equivalent.

C. Louvers shall be fabricated of 5052-H32 aluminum of alloy. Blades and frame shall be 14-gauge aluminum. Sound absorbent material shall be 4-pound density mineral wool held in place by 0.032 inch perforated aluminum panels. Aluminum shell shall be at 45° pitch. Louvers shall be fitted with 1/4-inch mesh 16-gauge aluminum bird screen in rewireable extruded aluminum frames held in place by suitable fasteners such that screens can be removed for cleaning. Louvers shall be fitted with extruded aluminum filter channel frame for 1” thick removable air filters.

D. Louvers and all associated components shall be factory primed and finished after assembly with oven-cured resin coating meeting the performance requirements of AAMA Specification 611, having a 2.0 MDFT, and in a color selected by the City.

E. Louvers shall be anchored with stainless steel studs at the jambs as shown in the Drawings and in accordance with the design submitted and favorably reviewed by the Engineer.
F. Provide tube aluminum and other stiffeners constructed in accordance with the design submitted and accepted.

2.02 FABRICATION - GENERAL

A. Louvers shall be delivered to the field complete and assembled ready for installation. Field cutting, welding, or alteration of the louver in the field shall not be allowed.

1. Continuous Vertical Assemblies: Where height of louver units exceed fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates and without interrupting blade-spacing pattern.

B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining materials’ tolerances and perimeter sealant joints.

1. Frame type: Channel type, unless otherwise indicated.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer or 72 inches on center, whichever is less. At horizontal joints between louver units, provide horizontal mullions, unless continuous vertical assemblies are indicated.

F. Join stationary blade, head and jamb frames with fillet welds concealed from view, unless the size of the louver makes bolted connections between louver sections necessary. Louver blades shall be joined to each jamb frame with a minimum of two fillet welds. Each fillet weld shall be a minimum of 1/8-inch leg and 1 inch in length.

G. Provide sill extensions and loose sills made of same material as louvers, where indicated or required, for drainage to exterior and to prevent water penetrating to interior.

H. Air filter shall be provided with extruded aluminum filter channel support attached to louvers. Air filter shall be aluminum, removable, and washable, MV EZ Kleen as manufactured by Research Product Corporation (888-742-2402) or approved equivalent.
PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate with the Contractor for required rough opening.

B. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction.

C. Opening to receive louvers shall be carefully constructed to be square, plumb and precisely measured prior to ordering louvers.

3.02 INSTALLATION

A. Locate and place louver units level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Install screens and filters.

E. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

F. Repair all damaged finishes. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

G. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

H. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses.

3.03 CLEANING, AND PROTECTING

A. Periodically clean exposed surfaces of louvers that are not protected by temporary covering to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
B. Protect louvers from damage during construction. Use temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at the time of substantial completion.

3.04 FIELD ADJUSTING AND SERVICE

A. Manufacturer's field services shall be provided in accordance with Section 01 64 00 and as supplemented herein.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by the City, remove damaged units and replace with new units.

1. Clean and touch up minor abrasions in finishes with coating compatible with factory-applied coating and as recommended by the manufacturer. Repair coating shall match color and gloss of factory-applied finish coating.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install non-acoustical metal louvers and accessories as shown on the Drawings and as specified herein.

B. Non-acoustical louvers shall be installed only in intermediate wall between pump and electrical rooms as shown on the Drawings.

1.02 RELATED WORK

A. Grout is included in Section 03 60 00.

B. Reinforced Concrete Block Masonry is included in Section 04 22 00.

C. Metal Work - General Provisions are included in Section 05 50 00.

D. Sealants and Caulking are included in Section 07 92 00.

1.03 SUBMITTALS

A. Submit the following to the Engineer in accordance with Section 01 32 19:

1. List of materials to be furnished.

2. Shop drawings and product data showing plan, elevations, sections, and spacing of louver blades. Show unit dimensions related to wall openings and construction; free area for each size indicated; profile of frames at jambs, heads, and sills; anchorage details and locations; bird or insect screen frame; air filter frame; and other pertinent data.

3. Manufacturer’s recommended installation procedures.


5. Certificate of Compliance: Certificates and test report by Air Movement and Control Association International Inc. (AMCA) certifying that products are in accordance with AMCA Standard 500-L demonstrating compliance with the
requirements and are licensed to bear the AMCA Certified Ratings Seal in accordance with AMCA Standard 511.

6. Professional Engineer Requirements: Drawings and structural calculations to be signed and sealed by a professional engineer licensed to practice in the state of California.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
   2. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

B. Air Movement and Control Association, Inc. (AMCA)
   1. AMCA 500-L – Laboratory Methods of Testing Louvers for Rating
   2. AMCA 501 – Application Manual for Air Louvers
   3. AMCA 511 – Certified Ratings Program Product Rating Manual for Air Control Devices

C. American Architectural Manufacturers Association (AAMA)
   1. AAMA 2603 – Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels

1.05 QUALITY ASSURANCE

A. Performance Requirements: Provide AMCA test data as required to confirm that the louvers have the specified air and water performance characteristics.

B. Structural Performance: Provide exterior weather louvers capable of withstanding the effects of loads and stresses from wind and normal thermal movement without evidencing permanent deformation of louver components, including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter; or permanent damage to fasteners anchors.
1. Wind load: Louvers shall withstand the effects of 25 psf of uniform pressure acting inward or outward.

2. Seismic load: Louvers, including attachments to other construction shall withstand seismic effects determined by ASCE-7.

3. Thermal Movements: Provide louvers that allow for thermal movements resulting from the 180 degree Fahrenheit maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, and other detrimental effects.

1.06 DElIVERY AND HANDLING

A. Marking:

1. Product shall bear identification markings that will remain legible during normal handling and storage. The marking shall be printed indelibly in ink or molded thereon in a manner that will not damage the product.

B. Delivery, Handling, and Storing:

1. All equipment, accessories, spares and fittings shall be prepared for standard commercial shipment unless otherwise specified.

2. Care shall be taken in loading, transporting, and unloading to prevent damage to the louver assembly. Handling shall be according to manufacturer's recommendations.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

The louvers shall be Type ESD-635 as manufactured by Greenheck or approved equivalent.

2.02 MATERIALS AND CONSTRUCTION

A. The louver shall be AMCA certified extruded aluminum weather louver designed to protect air intake and exhaust openings in building exterior walls.
B. The louver frame shall be heavy gauge extruded 6063-T5 aluminum, 6 in. x 0.081 in. nominal wall thickness.

C. The louver blades shall be drainable design, heavy gauge extruded 6063-T5 aluminum, 0.081 in. nominal wall thickness, positioned at 37-degree angles.

D. GPS 2 facility generator room louvers shall be fitted with 1/2 inch mesh 16-gauge aluminum bird screen in extruded aluminum frames held in place by suitable fasteners such that screens can be removed for cleaning.

E. Surge Tank 2 facility louvers shall be fitted with 18 x 14 mesh aluminum insect screen and aluminum filter in extruded aluminum frames held in place by suitable fasteners such that screens can be removed for cleaning.

F. AMCA Performance: A 4'-0" x 4'-0" unit shall conform to the following.

1. Free area – 9.41 sq. ft.
2. Free area velocity at the point of beginning water penetration – 1077 fpm
3. Intake pressure drop at the point of beginning water penetration – 0.16 iwg
4. Exhaust pressure drop at 1000 FPM free area velocity – 0.14 iwg

G. Louvers and all associated components shall be factory primed and finished after assembly with baked-on resin coating in color selected by the City. Baked-enamel finish coating as recommended by the manufacturer will be acceptable in color approved by the City.

H. All fasteners shall be stainless steel. The types, gauges, and length shall be in accordance with manufacturer’s installation instruction.

I. Louvers shall be dry packed into wall and anchored with stainless steel type 304 or 316 anchors as shown on the Drawings and in accordance with the approved submittal.

2.03 FABRICATION - GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

B. Continuous Vertical Assemblies: Where heights of louver units exceed fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice
plates and without interrupting blade-spacing pattern.

C. Equal blade spacing shall be maintained, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining materials' tolerances and perimeter sealant joints.

   1. Frame type: Channel type, unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer or 72 inches o.c., whichever is less. At horizontal joints between louver units, provide horizontal mullions, unless continuous vertical assemblies are indicated.

G. Provide sill extensions and loose sills made of same material as louvers, where indicated or required, for drainage to exterior and to prevent water penetrating to interior.

H. Join frame members to one another and to fixed louver blades with fillet welds concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction.

B. Opening to receive louvers shall be carefully constructed to be square, plumb and precisely measured prior to ordering louvers. The Contractor shall not be allowed to fill gaps larger than 0.125 inches between the louver frame and wall opening.
3.02 INSTALLATION

A. Louver units shall be placed plumb, level and in proper alignment with adjacent work.

B. Concealed anchorages shall be used wherever possible.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Install screens and filters in accordance with manufacturer’s recommendation and as specified herein.

E. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

F. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

G. Nonferrous metal surfaces in contact with concrete, masonry or dissimilar metals shall be coated with bituminous paint.

H. Install backer rods and sealants according to manufacturer's recommendations.

3.03 ADJUSTING, CLEANING, AND PROTECTING

A. Periodically clean exposed surfaces of louvers that are not protected by temporary covering to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Protect louvers from damage during construction. Use temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at the time of substantial completion.

D. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by the City, remove damaged units and replace with new units.
1. Clean and touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install fixed glass window system with aluminum framing and accessories as shown on the Drawings, as specified herein, and as required to complete the work.

B. Fixed glass window shall be installed within 8-inch masonry wall between Pump and Electrical Rooms.

1.02 RELATED WORK

A. Grout is included in Section 03 60 00.

B. Reinforced Concrete Block Masonry is included in Section 04 22 00.

C. Metal Work - General Provisions are included in Section 05 50 00.

D. Sealants and Caulking are included in Section 07 92 00.

1.03 SUBMITTALS

A. Submit the following to the Engineer in accordance with Section 01 32 19:

1. List of materials to be furnished.

2. Shop drawings showing layout plan, elevations, and sections of the glass window system and its major components with dimensions.

3. Aluminum frame details, including profile of frames at jambs, heads, and sills, and anchorage and connections details.

4. Glass data.

5. Sealant data.

6. Data for hardware, trim, gasket, and accessories.

7. Manufacturer’s recommended installation procedures.
8. Color chart for aluminum frame coating.

9. Color sample of aluminum frame if requested by the Engineer.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes

2. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

3. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers

4. ASTM C1036 - Standard Specification for Flat Glass

5. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass


7. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass

B. American Architectural Manufacturers Association (AAMA)

1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum

2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Architectural Extrusions and Panels


C. Glass Association of North America (GANA)

1.05 QUALITY ASSURANCE

A. Materials and equipment furnished under this Section shall be of manufacturers who have been regularly engaged in the design and manufacture of the materials and equipment for a period of at least 5 years.

B. Manufacturer's authorized representative who is trained and approved for installation of units shall be required for installation.

C. Each category of material shall be procured from a single manufacturer.

1.06 DELIVERY AND HANDLING

A. All material and accessories shall be prepared for standard commercial shipment.

B. Care shall be taken in loading, transporting, and unloading to prevent damage to the product. Handling shall be per manufacturer's recommendations.

C. Store products in manufacturer's unopened packaging until ready for installation.

D. See Section 01 65 00 for additional requirements.

PART 2 - PRODUCTS

2.01 DESIGN/PERFORMANCE REQUIREMENTS

A. Design glass window system to withstand live loads in accordance with applicable building code with maximum L/120 deflection.

B. Glass shall be tempered.

C. Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures.

   1. Interior temperature range from 50 degree Fahrenheit to 95 degree Fahrenheit.

D. Structural sealant shall be capable of withstanding tensile and shear stresses imposed by aluminum-framed systems without failing adhesively or cohesively.
2.02 FIXED GLASS WINDOW SYSTEM

A. Glass window system shall be comprised of aluminum frame, glass, louvers, anchors, hardware, sealant, gasket, and required accessories.

B. The size and dimensions shall be as shown on the Drawings and as measured in the field.

C. Window system shall be straight.

D. Glass shall be tempered clear glass. Glass thickness shall be as required, but not less than 3/8”.

E. Frame shall be made of aluminum alloy. Frame shall be TGIC polyester powder coated. The minimum thickness of the powder coating shall be 3.5 mils. The coating material shall be Series 38 as supplied by Tiger Drylac or approved equal. Finish shall be smooth matte. Color of the frame shall be as approved by the City.

F. All brackets, connectors, and accessories shall be aluminum or stainless steel.

G. All fasteners, hardware and anchors shall be stainless steel.

H. Provide other materials as required to complete the work.

2.03 MATERIAL

A. Aluminum
   1. ASTM B221, 6063-T6 alloy and temper.
   2. Aluminum frame shall be polyester powder coated. Color shall be selected by the City.

B. Glass shall conform to ASTM C1048, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select, Kind FT fully tempered. Thickness shall be as specified in 2.02.D.

C. Stainless steel material shall be Type 304 or 316.

D. Gaskets shall conform to ASTM C864, neoprene or EPDM, or ASTM C1115, silicone or thermoplastic polyolefin rubber, molded or extruded shape to fit glazing channel retaining slot.

E. Sealant shall be in accordance with Section 07920.
2.04 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Accurately fit and secure joints and intersections with ends coped or mitered. Make joints flush and hairline.

C. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

D. Fasteners, anchors, and connection devices shall be concealed from view to greatest extent possible.

E. Prepare components to receive anchor devices and hardware. Fabricate anchorage items.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Verify in field dimensions of openings where wall is to be constructed.

B. Do not begin installation until substrates and other adjoining connecting surfaces have been properly prepared.

C. Verify wall openings are ready to receive work of this section.

D. Clean surfaces thoroughly prior to installation.

3.02 INSTALLATION

A. Install all components in accordance with manufacturer's instructions and approved Shop Drawings.

B. Use appropriate anchorage devices to securely attach assembly to adjoining structural components, masonry walls.

C. Install components plumb and level, in proper plane, free from warp and twist.

D. Install glass and accessories in accordance with GANA Glazing Manual.
E. Installation Tolerances:

1. Maximum variation from plumb or level: 1/8 inch in 3 feet or 1/4 inch in any 10 feet, whichever is less.

2. Maximum misalignment of members abutting end to end: 1/16 inch.

F. Use concealed anchorages where possible. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.

G. Install concealed gaskets.

H. Install sealants and joint fillers all around the frames and where required.

I. Aluminum members to come in contact with dissimilar metals shall be protected against galvanic action by painting contact surfaces with primer, applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.

J. Aluminum surface to come in contact with concrete or masonry shall be coated with bituminous paint.

3.03 CLEANING AND PROTECTION

A. After installation and adjusting, clean metal and glass surfaces to remove dust, loose fibers, fingerprints, adhesives, and other foreign materials.

B. Protect wall system from damage during construction. Use temporary protective coverings where needed and approved by the manufacturer. Remove protective covering at the time of completion.

C. Clean and touch up minor abrasions in finishes with coating compatible with factory-applied coating and as recommended by the manufacturer. Repair coating shall match color and gloss of factory-applied finish coating.

END OF SECTION
SECTION 10 52 00
FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and install fire protection equipment, cabinets, and appurtenant work, complete.

1.02 CODES

A. The work of this Section shall comply with the current editions of the following codes:

1. California Building Code
2. California Fire Code

1.03 REFERENCE STANDARDS

A. Trade Standards:

1. National Fire Protection Association, Standard No. 10, Portable Fire Extinguishers
2. Underwriter's Laboratory, Fire Protection Equipment List

1.04 SUBMITTALS

A. The following shall be submitted to the Engineer in compliance with Section 01 32 19:

1. Manufacturer's catalogue containing technical data, installation instructions, and details.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Fire extinguishers and appurtenant materials shall be delivered in original unbroken packages or containers bearing the manufacturer's label with manufacturer's name, product description, and rating.
B. Storage: All materials shall be carefully stored in an area that is protected from deleterious elements as recommended by the material manufacturer. Storage shall be in a manner that will prevent damage to the material and its finish.

PART 2 - PRODUCTS

2.01 GENERAL

All fire protection equipment shall be from the same manufacturer and shall meet the requirements of NFPA Standard No. 10, Portable Fire Extinguishers.

2.02 FIRE EXTINGUISHERS

A. Pump Room: Fire extinguisher shall be 10 lb. minimum capacity, dry chemical type with minimum UL rating of 4A:80B:C in polyester powder coated steel container, for Class A, Class B, and Class C fires.

B. Electrical Room: Fire extinguisher shall be 11 lb. minimum capacity, Halotron type with minimum UL rating of 1A:10B:C in polyester powder coated steel container, for Class A, Class B, and Class C fires.

2.03 BRACKETS AND OTHER MATERIALS

A. Wall mounting brackets and cabinets shall be specially designed for extinguishers. Hardware shall be stainless steel.

B. All other materials, not specifically described, but required for a complete and proper installation of fire fighting devices shall be provided by the Contractor.

2.04 MANUFACTURERS

A. Dry chemical type fire protection equipment shall be Model B441 as manufactured by Amerex or approved equal.

B. Halotron I type fire protection equipment shall be Model 307 as manufactured by Amerex or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Brackets and Cabinets: All fire extinguishers shall be provided with and installed on brackets or brackets within cabinets. The Contractor shall block and reinforce the wall area as necessary to support the fire extinguishers.
B. Locations:

1. Number of fire protection equipment and their locations shall be verified with the City before installation and shall be installed where directed, in accordance with NFPA Standard No. 10, Portable Fire Extinguishers.

2. The minimum number of portable fire extinguishers and their approximate locations shall be as follows. Exact locations of portable fire extinguishers shall be determined in field in presence of the City.

   a. Electrical Room: One near exterior door (Halotron Type)

   b. Pump Room: One at each door (total two – Dry Chemical type)

END OF SECTION
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SECTION 11 21 40

VERTICAL TURBINE PUMPS AND MOTORS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required, to furnish, deliver, and install three vertical turbine pumps, including motors, pump cans, accessories, appurtenances and spare parts and provide field services, as specified herein and as shown on the Drawings.

B. All necessary accessory equipment and auxiliaries, whether specifically mentioned in this Section or not, shall be furnished, delivered, and installed as required for the project incorporating the highest standards for this type of equipment.

C. The pumps and motors shall be designed to operate with the specified soft starters and pump control valves.

D. Perform factory and field tests.

E. Provide services during installation and field testing of each unit.

F. Provide services during facility startup.

G. Maintain equipment in good condition until they are installed, tested, and accepted by the City.

H. Provide instructions and training to the City for operation and maintenance of the equipment.

1.02 RELATED WORK

A. Facility Startup is included in Section 01 75 00.

B. Earthwork is included in Section 02 20 00.

C. Sheeting, Shoring and Bracing are included in Section 02 40 00.

D. Steel Pipe and Fittings are included in Section 02 62 00.

E. Small Valves and Pipes are included in Section 02 64 20.
F. Pipe Appurtenances are included in Section 02 64 40.

G. Pipeline Testing and Disinfection is included in Section 02 66 00.

H. Concrete work is included in Division 3.

I. Shop painting and coating are included in Division 9.

J. Electrical work is included in Division 16.

K. Instrumentation, Loop Descriptions, and SCADA are included in Division 17.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01 32 19, shop drawings and product data. Submittals shall include the following:

1. Pumps:
   a. Name of manufacturer.
   b. Type and model number of each pump.
   c. Certified dimensional drawings of each item of equipment, component and auxiliary apparatus to be furnished.
   d. Literature and drawings describing the equipment in sufficient detail, including parts list and materials of construction, to indicate full conformance with the detail specifications.
   e. Required foundation, pump support and anchor bolt plans and details. Requirements shown on the Drawings are minimum.
   f. Required pump can/barrel design and drawings showing details and dimensions. Requirements shown on the Drawings are minimum.
   g. Schematic electrical wiring diagrams and terminal locations for winding and bearing temperature devices and space heaters.
   h. Painting and protective coating data.
   i. Weights of the following components; provide weight for each separate component:
      1) Complete discharge head assembly
      2) Complete bowl assembly
      3) Complete column assembly (all sections)
4) One column assembly

j. Manufacturer's certified rating curves to satisfy the specified design conditions as described in Section 2.02 showing pump characteristics of flow, head, brake horsepower, efficiency and guaranteed net positive suction head required (NPSHR) shall be submitted. Curves shall show the full recommended range of performance and include shut-off head. This information shall be prepared specifically for each pump. Catalog sheets showing a family of curves will not be acceptable.

k. Calculations as required in this Section.

l. Descriptions of factory and field test procedures and equipment.

m. A schedule of the date of factory testing and date of readiness for delivery of the equipment to the Site.

n. Certified results of factory tests must be accepted by the Engineer prior to delivery.

2. Electric Motors:

a. Submit motor data for acceptance; include complete nameplate data and test characteristics in accordance with NEMA Standard MG1-12.54 - Report of Test Form for Routine Tests on Induction Motors.

1) Guaranteed efficiency at full load

2) Full load speed, current and horsepower

3) Power factor at full load

4) Locked rotor and starting inrush current at 100% voltage

5) Motor outline, dimensions and weight

6) Enclosure type, accessories, and handling provisions

7) Descriptive bulletins, including full description of insulation system

8) Wiring connection diagrams and conduit connection details

9) Motor sound pressure level at 3 feet in dB(A)

10) Protective devices and accessories, including temperature sensors, speed sensors, alarm switches, etc.
11) Special features (e.g., space heaters, including voltages, wattage)

12) Maximum KVAR capacitance allowed

13) Tabulated data for the drive motors, including rated HP, full load rpm, power factor and efficiency curves, service factor and kW input. Submit a certified statement from the motor manufacturer that the motors are capable of continuous operation without affecting their design life for bearings or windings.

14) Factory (shop) test procedures and results.

3. Welder Certification

4. Operation and Maintenance Data:

   a. Complete operating and maintenance instructions shall be furnished for all equipment included under this Section. Operation and maintenance manuals shall including the following at a minimum.

      1) Equipment function, normal operating characteristics, and limiting conditions.

      2) Assembly, installation, alignment, adjustment, and checking instructions.

      3) Outline, cross-section, and assembly drawings; engineering data; and wiring diagrams.

      4) Operating instructions for startup, routine, and normal operation, regulation and control, shutdown, and emergency conditions.

      5) Lubrication and maintenance instructions.

      6) Guide to troubleshooting.

      7) Test data and performance curves, where applicable.

5. Field test procedures, results, and reports.

1.04 REFERENCE STANDARDS

   A. Design, manufacturing and assembly of elements of the equipment specified herein shall be in accordance with applicable portions and latest editions of the following:

   1. American Gear Manufacturers Association (AGMA)
2. American Institute of Steel Construction (AISC)

3. American Iron and Steel Institute (AISI)

4. American Society of Mechanical Engineers (ASME)

5. American National Standards Institute (ANSI)

6. American Society for Testing Materials (ASTM)

7. American Water Works Association (AWWA)

8. American Welding Society (AWS)

9. American Bearing Manufacturers Association (ABMA)

10. Hydraulic Institute Standards (ANSI/HI)
    a. Vertical Pumps, ANSI/HI 2.1 through 2.6
    b. Pumps-General Guidelines, ANSI/HI 9.1 through 9.5
    c. Centrifugal and Vertical Pumps for NPSH Margin, ANSI/HI 9.6.1
    d. Centrifugal/Vertical Pump Allowable Operating Region, ANSI/HI 9.6.3
    e. Vibration Measurements and Allowable Values, ANSI/HI 9.6.4
    f. Pump Intake Design, ANSI/HI 9.8

11. Institute of Electrical and Electronics Engineers (IEEE)

12. National Electrical Code (NEC)

13. National Electrical Manufacturers Association (NEMA)

14. Occupational Safety and Health Administration (OSHA)

15. The Society for Protective Coatings (SSPC)

16. Underwriters Laboratories (UL)

1.05 QUALITY ASSURANCE

A. Equipment shall be manufactured in the United States.

B. To assure unity of responsibility, the motors shall be furnished and coordinated by the pump manufacturer.
C. The equipment specified herein is intended to be standard pumping equipment of proven ability as manufactured by organizations having extensive experience in the production of such equipment similar to the applications stated in this Section.

D. Respective pumps and motors specified herein shall be furnished by a single manufacturer. All equipment must be supplied by the same pump manufacturer, including bowls, impellers, column, shafting, heads, couplings, seals, suction barrels and motors. Well drillers, distributors, or other fabrication shops will not be allowed to furnish equipment built in their local fabrication shop.

E. Equipment furnished under this section shall be fabricated and assembled in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

F. The pump manufacturer shall be certified to the ISO 9001 standard for design and manufacture of vertical turbine pumps.

G. The pump manufacturer shall be fully responsible for the design, arrangement and operation of all connected rotating components of the assembled pumping unit mounted on the barrel top plate, to ensure that neither harmful nor damaging vibrations occur.

H. All pressure containing fabrications shall be welded only by welders whom are qualified to ASME code section 9. Welder certification shall be provided as part of the submittal package.

I. The pump curve shall be continuously rising and shall be free from dips and valleys from the design point to the shutoff head.

J. Except as modified or supplemented herein, all vertical turbine pumps shall conform to the applicable requirements of ANSI/AWWA E101 and the Hydraulic Institute Standards.

K. Pumping units shall meet the minimum requirements of factory tests and field tests specified herein.

L. Manufacturer’s representatives shall provide complete field services as specified in this Section and in accordance with Section 01 64 00.
1.06 DELIVERY, STORAGE AND HANDLING

A. All parts shall be properly protected so that no damage or deterioration will occur during a potential prolonged delay period from the time of completion of manufacture until installation is completed.

B. All equipment, parts and spare parts must be properly protected and supported against any damage during shipment, handling and storage. Store all materials off the ground and under shed such that they are not subject to direct sunlight or rain. Maintain proper covering to avoid intrusion by rodents.

C. The pumps and respective electric motors may be shipped separately.

D. The delivery of the pumps and motors shall be coordinated with the City.

E. The finished surfaces of all exposed flanges shall be protected by wooden or equivalent blank flanges, strongly built and securely bolted thereto.

F. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

G. For protection of bearings during shipment and installation, the bearing shall be properly processed. Anti-friction bearings, if pre-lubricated, shall be protected in accordance with the bearing manufacturer’s recommendations against formation of corrosion during a long period of storage while awaiting completion of installation and startup of the machine in which they are used. Anti-friction bearings that are not pre-lubricated shall be properly treated in accordance with the bearing manufacturer’s recommendation against formation of corrosion during a long period of storage while waiting completion of installation and startup.

H. Do not store shaft and bearings horizontally.

I. Energize motor space heaters to prevent moisture condensation throughout the storage period. When motor is not stored in a dry, indoor, heated location, cover each motor with plastic or similar material and provide heated or circulating air and/or desiccant to protect against moisture condensation.

J. Refer to Section 01 65 00 for additional requirements for delivery, storage and handling.

1.07 MANUFACTURER’S SERVICES
A. Installation Services. The services of a qualified manufacturer’s representative shall be provided to check the installation and place the unit into service. Field services shall be provided in accordance with Section 01 64 00.

B. Startup Services. Services of the manufacturer’s representative shall be provided during the facility startup. During startup operations, the manufacturer’s representative shall ensure proper operation of all pumps and motor and make all necessary repairs and adjustments to provide a properly operating system. Startup services shall be provided in accordance with Section 01 75 00.

1.08 MAINTENANCE

A. Furnish all special tools and test equipment required for the proper servicing of all equipment as recommended by the manufacturer’s operations and maintenance descriptions. All such tools and test equipment shall be furnished in a suitable steel tool chest complete with lock and duplicate keys and provided to the City.

B. All spare parts shall be properly protected for long periods of storage and packed in containers that are clearly identified with indelible markings as to contents.

C. Furnish and deliver to City's yard at 1993 Rancho Conejo Blvd., Newbury Park, California the following spare parts for each size pump at the same time pumps are delivered.

1. One mechanical seal for each model installed on pumps.

PART 2 – PRODUCTS

2.01 GENERAL

A. Three pumps and motors are required as shown on the Drawings. Two pumps are regular operation pumps. One larger pump is dedicated as a fire pump.

B. The pumping units shall all be supplied by one manufacturer and shall be complete, including pumps, motors, accessories, appurtenances, and components required for proper installation and operation.

C. The pumps and motors shall be designed and built for 24-hour continuous service without overheating, without cavitation, and without excessive vibration or strain. All parts shall be so designed and proportioned as to have liberal strength, stability and stiffness and to be especially constructed to meet the
specified requirements. Ample room and facilities shall be provided for inspection, repairs and adjustment.

D. All necessary foundation bolts, nuts and washers shall be furnished and shall be Type 316 stainless steel.

E. Each major piece of equipment shall be furnished with a stainless steel nameplate (with embossed data) securely mounted to the body of the equipment. As a minimum, the nameplate for the pumps shall include the manufacturer's name and model number, serial number, rated flow capacity, head, speed and all other pertinent data. As a minimum, nameplates for motors shall include the manufacturer's name and model number, serial number, horsepower, speed, input voltage, amps, number of cycles and power and service factors.
2.02 PUMP PERFORMANCE AND DESIGN CRITERIA

A. The product to be pumped is clear potable water. For design and rating purposes, the water to be pumped shall be assumed to have a temperature of 70°F.

B. Pump operation shall be constant speed with soft starter.

C. The vertical turbine pumps will pump water supplied from 14-inch inlet/outlet (suction) pipe connected to the existing La Granada Reservoir to 16-inch pump discharge header pipe. Refer to Drawings for additional information pertaining to sizes and locations of pipes on suction and discharge sides. Pump discharge pipe connects to existing distribution pipes for Wilder Zone. Pumps will deliver water to Wilder Zone service area, including existing Wilder Reservoir.

D. Range of suction and discharge heads (pressures): The following tables provide range of heads for each pump. Pump shall be capable of operating efficiently with specified range of heads.

<table>
<thead>
<tr>
<th>Range of Heads for Pump P1 and P2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suction Head</td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>10 feet</td>
</tr>
</tbody>
</table>

Notes:
1. Total lift does not include losses through pump assembly.
2. Values are same for pumps P1 and P2.

<table>
<thead>
<tr>
<th>Range of Heads for Fire Pump P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suction Head</td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>10 feet</td>
</tr>
</tbody>
</table>

Notes:
1. Total lift does not include losses through pump assembly.
E. Pump design flow, head and efficiency conditions shall be as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Flow</th>
<th>Head</th>
<th>Minimum Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Flow</td>
<td>600 gpm</td>
<td>220 feet</td>
<td>79%</td>
</tr>
<tr>
<td>Design Flow</td>
<td>750 gpm</td>
<td>190 feet</td>
<td>82%</td>
</tr>
<tr>
<td>High Flow</td>
<td>900 gpm</td>
<td>150 feet</td>
<td>79%</td>
</tr>
</tbody>
</table>

Notes:
1. Total lift does not include losses through pump assembly.
2. Values are same for pumps P1 and P2.

<table>
<thead>
<tr>
<th>Item</th>
<th>Flow</th>
<th>Head</th>
<th>Minimum Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Flow</td>
<td>3000 gpm</td>
<td>285 feet</td>
<td>77%</td>
</tr>
<tr>
<td>Design Flow</td>
<td>4000 gpm</td>
<td>225 feet</td>
<td>80%</td>
</tr>
<tr>
<td>High Flow</td>
<td>4500 gpm</td>
<td>180 feet</td>
<td>73%</td>
</tr>
</tbody>
</table>

Notes:
1. Total lift does not include losses through pump assembly.

F. The pump supplier shall select the size and characteristics of the pumps to cover the required range of performance at the highest practical efficiencies, but not less than specified herein.

G. The maximum pump RPM at design conditions shall not exceed 1,770. Pumping units shall be designed for the performance and design requirements as required, at maximum speed unless otherwise noted.

H. Pump shutoff head for Pump P1 and P2 shall be approximately between 230 feet and 260 feet. Pump shutoff head for Pump P3 shall be approximately between 390 feet and 420 feet.

I. Maximum motor horse power shall be 50 HP for Pump P1 and P2. Maximum motor horse power shall be 300 HP for Pump P3.

J. Pump performance shall be stable and free from damaging cavitation, vibration, and noise within the operating head range. The performance of each pump with an enclosed impeller shall be based on a radial running clearance between the bowl wearing ring and the impeller of not less than 6 mils, or 0.5 mil per inch of wearing ring diameter, whichever is greater. The performance of each pump with an open impeller shall be based on a radial running clearance between the bowl and the impeller of not less than 15 mils.

L. The performance of the pumps stated by the Contractor shall be confirmed by field performance tests conducted after installation. Any efficiencies less than the Contractor's stated values must be corrected prior to making final payment.

2.03 PUMP CONSTRUCTION

A. Vertical turbine line-shaft pumps shall be water-lubricated, completely equipped with motor support and shall conform to AWWA E101, Vertical Turbine Pumps, where not in conflict with the specific requirements specified herein.

B. Materials for pump construction shall be in accordance with Paragraph “Pump Materials of Construction”.

C. The natural frequency of the assembled pump and its supporting structure shall be at least 25 percent above or below the desired operating range.

D. Bowl Assembly:

1. The water passages shall be lined with porcelain enamel. The waterways and diffusion vanes shall be smooth and free from nodules, bumps and dips and shall be cast of high quality free of blow holes, sand holes and other detrimental defects.

2. The bowls shall be accurately machined and fitted with a suction bell with integral cast ribs supporting the suction bearing. The bearings shall be sleeve type of the material listed and lubricated by the product being pumped.

3. The bearings shall be located above and below each impeller. The suction bearing shall be permanently packed with food grade grease, and shall have a length not less than 2 times the shaft diameter. The bowls shall be flanged with machined rabbet fit connections. Bolting material shall be 316SS.

4. Fit all bowls and impellers with renewable wear rings. The bowl and impeller wear ring faced shall have a minimum Brinnell hardness difference of 50BHN. Wear ring clearances shall not exceed 0.002 – inch clearance per inch of diameter.

5. The impellers shall be cast in one piece of the enclosed type. The impellers shall be made of tin bronze and statically and dynamically balanced. The impellers shall be securely fastened to the shaft with taper split bushings (collets) made of 316SS. Impellers shall be adjusted vertically by external means and shall have sufficient axial clearance for reliable service in
accordance with the specified operating conditions. Bowl shaft shall be made of 416SS.

6. The suction bell shall be fitted with a heavy gauge wire woven basket type strainer made of 316SS. The strainer shall have a net inlet equal to at least four times the suction pipe area. The maximum opening shall not be more than 75% of the minimum opening of the water passage through the bowl and impeller. The strainer shall be secured to the suction bell by means of bronze clips and 300 series stainless steel cap screws.

E. Column Assembly:

1. The column pipe shall be flanged with rabbeted fits to ensure proper alignment. The weight of the column pipe shall be no less than that stated in ANSI/AWWA Specification E101. The column size shall be such that friction loss will not exceed 5’ per 100’, based on the rated capacity of the pump. Intermediate column section lengths shall not exceed 10 feet. The top and bottom sections shall not exceed 5 feet.

2. Column pipe shall be made of ASTM A53 Grade B welded steel material. The material thickness shall be as required by the design, but not less than 0.375 inch. Connections shall be flanged with 316SS bolts.

3. The column line shaft shall be turned, ground and furnished in interchangeable sections not over 10 feet in length. The column line shaft and couplings shall be made of 416SS. The butting faces shall be machined square to the axis of the shaft with maximum permissible misalignment of the thread axis with the shaft axis 0.002” in 6”. The size of the shaft shall be no less than that determined by ANSI/AWWA-E101 Specifications, Section 5.5 and shall be such that elongation due to hydraulic thrust will not exceed the axial clearance of the impellers in the pump bowls. Maximum run out shall not exceed 0.005” in 10 feet. The line shaft bearings shall be sleeve type. Line shaft bearing spacing shall be such that shaft first critical frequency shall be safely above or below the operating frequency.

4. Threaded shaft couplings shall be supplied for shafts less than 2-3/4” diameter and shall be sized per ANSI/AWWA E101 section A-4.1.4. They shall utilize left-hand threads to tighten during operation.

5. Bearing retainers shall be of the drop-in type, held in place by compression of the butted ends of the column pipe.

F. Discharge Head:

1. The discharge head shall be fabricated of carbon steel materials using ASTM A181 flanges, ASTM A53 Grade B body pipe and ASTM A36 steel.
plate. Discharge head design shall be capable of containing maximum pressure developed by pump plus suction pressure.

2. The discharge flange shall be 150# ANSI raised face with bolt holes straddling the vertical centerline. A ¼” NPT pressure gauge connection shall be supplied on the top centerline of the discharge outlet.

3. A ¾” NPT barrel vent tap shall be provided to vent air from the top of the barrel.

4. The top of the discharge head shall be machined to accept a standard NEMA P base driver and have a diameter equal to the driver base diameter.

5. The base flange shall be machined, drilled and gasketed to provide a pressure containing seal to the top of the suction barrel. Connection between base flange and suction barrel shall be watertight.

6. All couplings and other moving or rotating parts shall be covered on all sides by an OSHA approved coupling guard. Coupling guards shall be fabricated from 16 USS gage or thicker galvanized or aluminum-clad steel or from 1/2 inch mesh expanded metal. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard.

7. The pump shall be furnished with a stainless steel nameplate securely mounted to the discharge head. At a minimum it shall contain information providing design flow, design TDH, HP, RPM, bowl model number, number of stages, manufacturer serial number, pump type and impeller setting dimension.

8. A rigid Flanged Adjustable “Spacer” type Coupling (FASC) shall be provided to couple the motor shaft to the pump shaft. The spacer shall be of sufficient length to allow the mechanical seal to be removed without disturbing the motor. This coupling shall allow for the vertical adjustment of the shaft mounted impellers.

9. The discharge head shall be fitted with a mechanical seal. The seal shall be of the cartridge type, sleeve mounted, easily replaceable and have its face continuously flushed with the product being pumped. The seal shall be equivalent to the Chesterton 155 or John Crane 5610.

10. Provision shall be made to accommodate low suction water probes.

G. Suction Barrels (Cans):

1. Suction barrel diameter shall be as determined by the pump manufacturer, but not less than shown on the Drawings. Length shall conform to
Hydraulic Institute Standards and meet minimum requirements shown on the Drawings. Thickness of steel barrel shall be as determined by the pump manufacturer, but not less than shown on the Drawings.

2. Barrel shall have a steel anchor ring welded near top of the barrel as shown on the Drawings.

3. Barrel inlet nozzle and the flange shall be located as shown on the Drawings. Pump barrel shall be designed in such a manner as to prevent submerged vortices from being developed. Barrel shall have a rounded (or dished-head) bottom to provide a smooth transition of the flow into the pump’s suction inlet as shown on the Drawings.

4. The barrel’s square top mounting plate shall be of sufficient thickness to drill and tap for ANSI rated flange bolting to match the base flange of the discharge head. The minimum size and thickness shall be as shown on the Drawings. The top mounting plate of the barrel shall be properly machined and be gasketed or “O” ringed for a zero leakage connection to the discharge head. The pressure rating of the barrel shall be capable of containing the maximum suction pressure.

5. Each pump barrel shall be vented through the sub base to the air relief valve indicated. The pumping system shall be designed to be supported from the base of the can.

6. The suction barrel shall be fitted with 2 direction vanes to reduce hydraulic swirling. They should be welded to the inside of the barrel in line with the suction centerline and located 180 degrees apart.

7. Provision shall be made to accommodate low suction water probes.

### 2.04 ANCHORAGE AND VIBRATION ANALYSES AND DESIGN

A. Pump anchorages shall be designed for lateral seismic forces applied simultaneously with normal pump operation forces, as well as for maximum reactions due to other pump design events. Seismic calculations shall be performed in accordance with the applicable codes, including CBC and by a registered civil engineer. Calculations shall be submitted to Engineer for approval. Anchorage shall meet the minimum requirements shown on the Drawings.

B. The pump manufacturer shall perform both lateral and torsional critical speed analyses to identify and ensure that (a) the first lateral critical speed shall be at least 25 percent above or below the desired operating range, and that (b) no torsional natural frequencies occur within a range extending from 25 percent below to 25 percent above the specified operating speed range, and that (c)
any blade excited resonant frequency shall be no closer than plus or minus 25 percent of the natural frequency of any part of the installed assembled pumping unit. All calculations shall be submitted to the Engineer for acceptance. Prior to manufacture, a statement must be forwarded to the Engineer indicating that the required analyses have been made and that the specified limitations will be met.

2.05 VERTICAL ELECTRIC MOTORS

A. The pump motors shall be furnished by the pump manufacturer.

B. Each pump motor shall have the following features.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moto HP</td>
<td>50HP for Pump P1 and P2 and 300HP for Pump P3</td>
</tr>
<tr>
<td>Electrical Power</td>
<td>480 volt, 3 phase, 60 Hz</td>
</tr>
<tr>
<td>RPM</td>
<td>1770</td>
</tr>
<tr>
<td>Enclosure</td>
<td>WP-1</td>
</tr>
<tr>
<td>Efficiency Rating</td>
<td>Premium</td>
</tr>
<tr>
<td>Motor Operation</td>
<td>Constant speed</td>
</tr>
<tr>
<td>Service Factor</td>
<td>1.15</td>
</tr>
<tr>
<td>Shaft Type</td>
<td>Solid Shaft</td>
</tr>
<tr>
<td>Insulation</td>
<td>Class F insulation with Class B temperature rise</td>
</tr>
<tr>
<td>Bearings</td>
<td>Vacuum pressure impregnated</td>
</tr>
<tr>
<td>Non-Reverse Ratchet</td>
<td>Shall be included</td>
</tr>
</tbody>
</table>

C. The motors shall be constructed and guaranteed to withstand runaway reverse speed equal to 150 percent of synchronous speed.

D. Each pump shall be directly connected to its driver by means of an adjustable flanged spacer coupling, suitably sized to transmit the required driving torque and be easily accessible for impeller adjustment or mechanical seal replacement.

E. Bearings shall be adequate to withstand all axial loading including the weight of the pump shaft, the pump and the hydraulic thrust. All bearings shall be provided with suitable seals to confine the lubricant and prevent the entrance of dirt and dust.

F. The motor shall have winding temperature detectors and bearing temperature detectors and a thrust bearing capable of handling both the mechanical and hydraulic thrust of the pump. Each motor shall have six 100 ohm resistance type temperature detectors in the stator winding located in the slots between
the coil sides of different phases and suitably distributed around the circumference and at points of normally highest temperature, all in accordance with AIEE recommendations. Conductors to each detector element shall be laid up in a single strip brass or bronze armor. One conductor from each element shall be grounded to the stator at the terminal block. Suitable provisions shall be made in the motor terminal boxes for terminating the necessary control leads for remote signal and protective circuit.

G. Each motor upper bearing shall be oil lubricated and provided with a 100-ohm resistance temperature detector (RTD) sensor.

H. One bearing temperature relay shall be provided for each motor bearing, with sensing element in as close proximity to the bearing metal as possible.

I. One bearing oil temperature relay shall be provided in each bearing oil reservoir. Provide oil level site gauge for each oil reservoir.

J. One dial thermometer for each bearing oil reservoir and one for each motor bearing. Thermometers shall have minimum 3-inch diameter dials in corrosion resistant, weatherproof and dustproof housings.

K. The motor shall be compatible with the approved soft starter.

L. The motor shall incorporate a non-reverse ratchet or approved equivalent.

M. Each motor shall be supplied with space heaters sized by the motor manufactured to prevent moisture from collecting in the motor when it is shut down. Space heater leads shall be wired to a separate auxiliary conduit box. Space heater shall be designed and furnished for 240 VAC.

N. Each motor shall be supplied with a grounding terminal lug in power cable conduit box.

O. Each motor shall be supplied with an oversized power cable conduit box. Each motor shall be supplied with a motor accessory terminal box, NEMA 250, Type 12 containing terminal strips for all wires.

P. Each motor shall be provided with screens over all openings.

2.06 SPECIAL TOOLS AND ACCESSORIES

A. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments and accessories, required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.
B. All required accessories, appurtenances, hardware shall be provided for proper and complete installation of pumps and motors.
2.07 MATERIALS OF CONSTRUCTION

<table>
<thead>
<tr>
<th>Component</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Bowls</td>
<td>Cast Iron (ASTM A48 c130 – Epoxy Lined)</td>
</tr>
<tr>
<td>Impellers</td>
<td>876 Bronze – (ASTM B584 C87600)</td>
</tr>
<tr>
<td>Bowl Assembly Shaft</td>
<td>416 SS - (ASTM A582-88a Type 416)</td>
</tr>
<tr>
<td>Bowl Bearings</td>
<td>Bronze – Bismuth Tin Bronze (UNS C89835)</td>
</tr>
<tr>
<td>Impeller Collets</td>
<td>316 SS - (ASTM A276-90a Type 316)</td>
</tr>
<tr>
<td>Bowl Bolting</td>
<td>304 SS – (ASTM F593 Gr CW1)</td>
</tr>
<tr>
<td>Bowl Wear Rings</td>
<td>Bronze - (ASTM B148-89a Alloy 954)</td>
</tr>
<tr>
<td>Impeller Wear Rings</td>
<td>Bronze - (ASTM B505-91 Alloy 952)</td>
</tr>
<tr>
<td>Strainer</td>
<td>316 Stainless Steel</td>
</tr>
<tr>
<td>Column Pipe Thickness</td>
<td>ASTM A53 Gr. B, Standard Steel Pipe</td>
</tr>
<tr>
<td>Column Bolting</td>
<td>304 SS - (ASTM F593 Gr CW1)</td>
</tr>
<tr>
<td>Line Shaft</td>
<td>416 SS – (ASTM A582-88a)</td>
</tr>
<tr>
<td>Line Shaft Couplings</td>
<td>416 SS – (ASTM A582-88a)</td>
</tr>
<tr>
<td>Line Shaft Bearings</td>
<td>Styrene Butadiene Rubber (SBR)</td>
</tr>
<tr>
<td>Bearing Retainers</td>
<td>Ductile Iron – (ASTM A536-84 Gr 60-40-18)</td>
</tr>
<tr>
<td>Discharge Head</td>
<td>Fabricated Steel - (A36-Gr 70 plate, A105 flange, A53-</td>
</tr>
<tr>
<td></td>
<td>Gr B pipe)</td>
</tr>
<tr>
<td>Name Plate</td>
<td>Stainless Steel</td>
</tr>
</tbody>
</table>

2.08 PROTECTIVE COATINGS

A. All ferrous material coming in contact with water (submerged interior surfaces) shall be coated using NSF 61 approved epoxy coating. All other ferrous surfaces shall be epoxy coated. Epoxy coating systems, including materials, thickness, and applications shall be in accordance with Section 09 99 10.

B. Approved equal coating system will be acceptable.

C. Suction can/barrel shall have mortar coating and epoxy lining as shown on the Drawings.
2.09  SHOP (FACTORY) TESTS

A. General:

1. The City shall be notified at least 15 Calendar Days in advance of factory tests for pumps and motors.

2. At his discretion, the City may witness the factory tests and inspect any equipment to be furnished under this Section prior to their shipment from place of manufacture.

3. Waiving of the City’s right to witness inspection and testing of the equipment shall in no way relieve the manufacturer of the responsibility of performing the specified tests or furnishing equipment in accordance with these Specifications.

B. Pumping Units:

1. Types of Tests: The following tests shall be performed for each pumping unit in accordance with Hydraulic Institute requirements.

   a. Hydrostatic Test
   b. Performance Test
   c. Mechanical Test

2. Test Reports:

   a. Document all testing procedures and results in accordance with applicable for Hydraulic Institute Standards.

   b. Submit three copies of test data to Engineer for acceptance. Submit one copy to City's inspector at plant if tests are witnessed by the City's inspector.

   c. Acceptance or rejection of each item for delivery shall be based upon the results of these tests and no pump or motor shall be released for shipment except after acceptance by the Engineer of test reports. Also prior to delivery, the Contractor shall be required to furnish a sworn certificate from the pump and motor manufacturers stipulating that each pump and motor to be furnished is in full conformance with these Specifications requirements.

   d. Include performance test reports in the Operation and Maintenance Manual.
C. Motors:

1. Each motor shall be given a routine (short commercial) test per NEMA and ANSI standards to determine that it is free from mechanical and electrical defects. Tests shall be performed in accordance with IEEE 112 and test results shall be recorded and submitted. Tests shall consist of the following:

   a. Winding resistance
   b. No-load current, power and nominal speed
   c. High potential test
   d. Bearing inspection
   e. Locked rotor current

2.10 MANUFACTURERS

A. Weir Floway, Inc.

B. Approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Contractor shall be responsible for the proper installation of all equipment in accordance with manufacturer's recommendations and the Contract Documents.

B. Pumping unit shall be installed plumb.

C. All damaged painting and coating shall be repaired per Section 09 92 00.

D. Pumps and cans shall be disinfected along with pipeline disinfection or using spray method specified in Section 02 66 00.

3.02 FIELD TESTS AND SERVICE

A. Manufacturer's field services shall be provided in accordance with Sections 01 64 00 and 01 75 00 and as supplemented herein.

B. The equipment manufacturer shall furnish a qualified field installation supervisor during the equipment installation. Such services shall be included in the contract price for the number of days and round trips to the site as required. Manufacturers’ installation supervisor shall observe, instruct, guide, and direct the installing contractor's erection or installation procedures.
C. An experienced, competent, authorized representative of the manufacturer shall visit the site of the Work and Inspect, check, adjust if necessary, and approve the equipment installation.

D. Field tests for each pump and motor unit shall be performed to demonstrate satisfactory installation, performance and operation without unusual or excessive noise, excessive vibration, cavitation, leakage, and overheating of bearings.

E. Field testing shall be supervised by an experienced field representative of the manufacturer with the assistance of the Contractor. The costs of all work performed by the manufacturer’s representative shall be borne by the Contractor. The City will pay the costs of power and water. The field testing will be witnessed by the City.

F. Written test procedures shall be submitted to the Engineer for approval during shop drawing submittal phase.

G. Provide, calibrate, and install all temporary gauges, devices, and meters required for the field tests.

H. Make necessary tapped holes in the pipes, and install all temporary piping and wiring required for the field tests. All temporary holes shall be plugged.

I. The seal between the barrel top plate and discharge head shall be tested for the capability to hold 30 inches Hg vacuum. The vacuum can be created by injecting water into the sealed annular space and shutting in or by using a Contractor-supplied vacuum pump. Adequacy of seal shall be demonstrated by the annular space holding 30 inches Hg vacuum for 30 minutes with no drop in vacuum.

J. The Contractor shall prepare and submit reports summarizing all field testing activities and results for each pump. The Contractor shall certify in the report that the pumping unit has been properly installed, adjusted, and lubricated, and is ready for operation by the City. Satisfactory completion of the field testing and acceptance of the report shall be required for final acceptance of each pumping unit. The report shall be included in the O&M Manual.

K. If a pump performance does not meet the requirements of these Specifications, corrective measures shall be taken, including removal of the pump and replacement with a pump that satisfies the requirements of these specifications.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, appurtenances and incidentals required and install butterfly valves, complete as shown on the Drawings and as specified herein.

B. Furnish and install all necessary guides, actuator, spacers, supports, accessories, and all other appurtenant items specified or required for the proper installation and operation of the valves.

1.02 RELATED WORK

A. Steel Pipe and Fittings are included in Section 02 62 00.

B. Shop Coating is included in Section 09 91 00.

C. Petrolatum Tape and Petroleum Wax Tape Coatings are included in Section 09 93 00.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01 32 19, the following:

1. Shop Drawings showing all important details of construction and dimensions, including positions of actuator and lifting lugs, the total weight of each item, and complete bill of materials.

2. For each size flange, submit number of bolts and diameter of bolt circle.

3. Coating systems information and data.

4. Laying length of valve in inches.

5. Number of hand wheel turns for 90 degrees of disc travel.
B. Certificates

1. Three certified copies of test reports shall be submitted to the Engineer for acceptance. Acceptance or rejection of each item for delivery shall be based upon the results of these tests and no valve shall be released for shipment except after acceptance by the Engineer of test reports. Also prior to delivery, the Contractor shall be required to furnish a sworn certificate from the valve manufacturer, stipulating that each valve to be furnished is in full conformance with these Specification requirements.

C. Color chart for exterior coating.

1.04 QUALITY ASSURANCE

A. Materials and equipment furnished under this Section shall be of manufacturers who have been regularly engaged in the design and manufacture of the materials and equipment for a period of at least 5 years. Demonstrate to the satisfaction of the Engineer that the quality is equal to the materials and equipment made by the manufacturers specifically named herein if an alternate manufacturer is proposed.

B. Factory Quality Control: The manufacturer shall test all products as noted herein and by the reference specifications.

C. Testing shall be in accordance with Paragraph 1.05 of this Section.

1.05 FACTORY TESTING

A. Butterfly valves, including actuators, shall be factory tested in accordance with the requirements of AWWA C504 and as supplemented herein. Additionally, all butterfly valves shall be hydrostatically tested per AWWA C504, except leakage testing is modified to be in both directions. Any sign of leak during the leakage test, or hydrostatic test, or failure of the performance test, or the protective coating test shall be grounds for rejecting the valve. Submit certified test results for tests specified in AWWA C504 Sections 3.8 and 5.2.

B. Hydrostatic Test. Each valve shall be completely assembled and hydrostatically tested in the shop using a test pressure equal to two times the specified water working pressure. With both inlet and outlet openings of the valve closed by suitable heads, using full face gaskets and with the valve ring in a partly open position, the test pressure shall be maintained for the duration listed below during which time the valve shall show no evidence of cracks, seepage or other defect.
<table>
<thead>
<tr>
<th>Nominal Valve Size</th>
<th>Pressure Test Duration (Minimum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-inch and smaller</td>
<td>5 minutes</td>
</tr>
<tr>
<td>10-inch through 20-inch</td>
<td>10 minutes</td>
</tr>
<tr>
<td>24-inch and larger</td>
<td>15 minutes</td>
</tr>
</tbody>
</table>

C. Leakage Test. Bi-directional leakage test shall be performed by applying test pressure on each side of the valve. During leakage test in each direction, apply 1.5 times the specified working water pressure on one side of the seat, and this pressure shall be maintained for the duration listed below with the valve ring in the closed position. During the leakage test, the valve shall be bottle tight.

<table>
<thead>
<tr>
<th>Nominal Valve Size</th>
<th>Pressure Test Duration (Minimum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-inch and smaller</td>
<td>5 minutes</td>
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<td>10 minutes</td>
</tr>
<tr>
<td>24-inch and larger</td>
<td>15 minutes</td>
</tr>
</tbody>
</table>

1.06 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)
   1. ANSI/ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
   2. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through 24

B. American Society for Testing and Materials (ASTM)
   1. ASTM A48 - Standard Specification for Gray Iron Castings
   2. ASTM A116 - Standard Specification for Metallic-Coated, Steel-Woven Wire Fence Fabric
   4. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes
   5. ASTM A436 - Standard Specification for Austenitic Gray Iron Castings
C. American Water Works Association (AWWA)

1. AWWA C207 - Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm)

2. AWWA C504 - Standard for Rubber-Seated Butterfly Valves

3. AWWA C550 - Standard for Protective Interior Coatings for Valves and Hydrants

D. Underwriters Laboratories (UL)

PART 2 - PRODUCTS

2.01 GENERAL

A. Valve sizes are nominal inside diameter unless otherwise noted. Butterfly valves shall consist essentially of a body, rubber seat, a disc, a valve shaft, and an operating mechanism.

B. Unless otherwise shown, valves shall have flanged ends.

C. All materials delivered to the Site shall be new, free from defects, and marked to identify the material, class, and other appropriate data.

D. All valves shall be suitable for mounting in any position and designed for two-directional flow.

E. All valves shall be furnished with position indicators and with manual or electric actuators, and handwheels as specified in the Contract Documents.

F. All valve openings shall be weatherproofed with a plastic wrap (10 mils minimum thickness) or plywood (3/8" minimum thickness) covering to prevent foreign material from entering the water passages during shipping and storage.

2.02 VALVES AND ACCESSORIES

A. Butterfly Valves

1. Standard: AWWA C504, except as modified herein.

2. Pressure Class:

   a. Unless otherwise noted, all valves shall be rated for 150 psi minimum.
b. Valves shall be bubble-tight at rated pressure in either direction.

3. Materials:
   a. General:
      1) Cast iron shall be close grained and conform to ASTM A126, Class B, or ASTM A48, Class 40.
      2) Ductile iron shall conform to ASTM A536 Grade 65-45-12.
      3) Stainless alloy cast iron shall conform to ASTM A436, Type 1.
      4) Stainless steel shall conform to ASTM A276, Type 304 or Type 316.
      5) Bronze shall conform to ASTM B584, but bronze that may be in contact with water shall contain not more than 5 percent zinc nor more than 11 percent aluminum.
   b. Body: The valve body shall be cast iron or ductile iron for valve sizes 20 inches or smaller.
   c. Disc: Cast or ductile iron of one-piece design with Ni-Chrome or Type 316 stainless steel edge.
   d. Valve Shaft: Type 304, Type 316 stainless steel, or ASTM A-564 Type 630, condition H-1150.
   e. Seats: Buna-N of suitable hardness.

4. Construction:
   a. Seats: Applied to body. Cartridge type seats with retaining rings are not acceptable.
   b. Disc to Shaft Connection: Stainless steel pins or torque plug.
   c. Shaft: Scribe both ends of the shaft to indicate valve position.
   d. Valve Diameter Limitation: Internal diameter of valve at the throat shall be no less than the nominal diameter of the valve less 1-1/2 inches.
   e. Provide adjustable mechanical stops to prevent over travel of the valve disc in both the open and closed positions. Stops shall be capable of absorbing full operating torque with a minimum design safety factor of five.
5. Operating Conditions:
   a. Valves shall be suitable for frequent operation in a throttled position for controlling flow of clean, cold, potable water, as well as for operation after long periods of idleness in either the open or closed position.
   b. Operating mechanisms shall positively retain the disc in all increments of movement from full open to full close.
   c. Valves shall be designed for installation in open air, in underground vaults that may be flooded occasionally under adverse conditions, or for buried service.
   d. Valve shall be designed to withstand an unbalanced pressure equal to the design class of the valve.
   e. The valve and actuators shall be suitable for a flow of 16 feet per second.

6. Finish:
   a. Interior and exterior coatings shall be per Paragraphs 2.03 and 3.04.

7. Flanges:
   a. Dimensions and drilling in accordance with AWWA C207.
   b. Flat-faced and back-faced or spot-faced, suitable for use with full-faced gaskets. Valves that are to be equipped with insulated flange kits shall not be spot-faced and must be back-faced.
   c. Faces shall have a serrated finish of approximately 32 serrations per inch and approximately 1/64-inch deep. Serrations may be either spiral or concentric.

8. Lifting Lugs: Provide at least two lifting lugs for valves larger than 3 inches and smaller than 12 inches. Provide four lifting lugs for valves larger than 12 inches. Lifting lugs shall be either integrally cast or permanently affixed to the valve body or the flange, respectively. Orientation of the lifting lugs shall be appropriate for the installation orientation of the valve.
9. Shaft Seals and Packing:
   a. Shaft seals, when used, shall be rubber and of the O-ring type. Shaft seals may be either circular or hexagonal shape.
   
b. Packing shall be an O-ring type of rubber packing, a U-Cup seal packing or self-adjusting Chevron type packing.

10. Manufacturer and Model:
   a. Valves manufactured by DeZurik; K-Flo; Pratt; or approved equal.
   
b. Valves must be manufactured in the U.S.

B. Actuators

1. General:
   a. The operating mechanism shall be totally enclosed and sturdy in construction, shall impart rotary movement to the valve shaft, and shall positively retain the disc in a definite position corresponding to all positions of the actuating medium. The design of the operating mechanism shall be such that the packing on the main shaft can be replaced without disassembling the mechanism, while the valve is in the line under full operating pressure and shall be constructed so that it can be removed from the valve as a unit without removing the valve proper from the line. In lieu of the above requirements, the operating mechanism may be such that the shaft can be completely repacked under pressure, by two men and regular tools within a 3-hour period, including any time required for disassembling and reassembling the operating mechanism or any portions thereof.

   b. Provide valve position indicators on all actuators.

   c. Actuator positions shall be as shown on the Drawings or as selected by the Engineer from the manufacturer’s available positions.

2. Manual Valve Actuators:
   a. Handwheel Type: Actuators shall have all operating parts enclosed and shall be grease packed and weatherproof. Actuators shall open the valves with a counterclockwise rotation. Cover bolts shall be Everdur or stainless steel. The rated maximum output torque of each operator shall be greater than or equal to twice that required to seat or unseat the disc against full unbalanced pressure equal to the design pressure and that
required to operate the valves in any position with velocities as specified in “Operating Conditions” herein.

b. Operating Nut Type: Actuators shall be provided with standard AWWA 2-inch operating nuts, with a required input force not to exceed 150 ft.-lbs. on the nut.

c. If required, provide actuator extensions for proper operation of handwheel.

d. Manufacturers: With the exception of the valve manufacturer’s standard link and lever components, subject to the Engineer’s acceptance, all manual operating mechanisms, including all secondary torque units, shall be the product of Limitorque, Auma, EIM, Rotork, or equal.

2.03 PAINTING AND COATING VALVES AND APPURTEYNANCES

A. All coatings used on wetted surfaces shall be suitable for water service.

B. Wetted interior surfaces of valves shall be coated with liquid epoxy or fusion bonded epoxy in accordance with Section 09 91 00. The pipe connection openings shall be capped to prevent the entry of foreign matter prior to installation.

C. Exterior surface of exposed valves and appurtenances shall be shop coated with a complete paint system in accordance with Section 09 91 00. Color for exterior coating shall be selected by the City. Submit color chart for City’s approval.

D. Exterior surface of buried valves and appurtenances shall be shop coated with a prime coat in accordance with Section 09 91 00.

E. All gears, bearing surfaces and other surfaces not to be painted shall be given a heavy coat of grease or other suitable rust resistant coating unless otherwise specified herein. This coating shall be maintained as required to prevent corrosion during any period of storage and installation and shall be satisfactory to the City through the time of final acceptance.

F. Perform holiday testing of the completed paint system per NACE SP0188 requirements. Repair any holidays noted.
PART 3 - EXECUTION

3.01 BURIED VALVES INSTALLATION

A. Buried valves and boxes shall be installed in accordance with manufacturer's recommendations in conformance to AWWA C504 except as specified herein. Valves shall be set with the operating stem vertically aligned in the center. Valves shall be set on a concrete foundation and supported by tamping selected excavated material at the sides of the valve. Care shall be taken in handling the valves to prevent damage and ensure proper installation. Where applicable, all valves as furnished shall be marked to correspond with the designation on the Drawings. Care shall be taken to install valves properly with respect to direction of flow where applicable.

B. Valve boxes shall be installed vertically, centered over the operating nut, and the elevation of the top shall be adjusted to conform to the finished surface of roadway or other surface at the completion of the contract. Boxes shall be adequately supported during backfilling to maintain vertical alignment.

3.02 EXPOSED VALVE INSTALLATION

A. Valve shall be installed as shown on the Drawings and in accordance with manufacturer’s recommendations. Exposed valves and specials shall be installed true and plumb as indicated. Coordinate operator locations as indicated.

B. Provide valve drains and appurtenances as indicated and as required.

C. Unless more than one support is shown on the Drawings, provide at least one support for each valve. Support shall be in accordance with the Drawings.

3.03 FLANGE INSULATION

Where shown on the Drawings, install insulating flanges.

3.04 FIELD PAINTING AND PROTECTIVE COATING

A. Shop applied coating, if damaged, shall be repaired in field per manufacturer’s recommendations and Section 09 92 00.

B. Field coating of buried valves shall be in accordance with Section 09 93 00.

3.05 FIELD TESTS AND SERVICES

Valves shall be field tested after installation for proper operation including hand wheel and gears. Water tightness of each valve shall be checked following
pressurization of the pipeline. Operation shall be satisfactory to the City in all respects.

END OF SECTION
SECTION 11 26 70
RESILIENT WEDGE GATE VALVES

PART 1 - GENERAL

1.01 GENERAL

Furnish all labor, materials, equipment and incidentals required and install resilient wedge gate valves, complete as shown on the Drawings, as specified herein and as required to complete the work.

1.02 RELATED WORK

A. Pipe Appurtenances are included in Section 02 64 40.

B. Shop Coating is included in Section 09 91 00.

C. Field Painting and Protective Coating are included in Section 09 92 00.

D. Petrolatum Tape & Petroleum Wax Tape Coatings are included in Section 09 93 00.

1.03 REFERENCE STANDARDS

A. American Water Works Association (AWWA)
   1. AWWA C509 - Resilient Wedge Gate Valves for Water Supply Service
   2. AWWA C550 - Protective Interior Coatings for Valves and Hydrants

B. American National Standards Institute (ANSI)
   1. ANSI/ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125 and 250

C. American Society for Testing and Materials (ASTM)
   1. ASTM D429 – Standard Test Methods for Rubber Property – Adhesion to Rigid Substrates
1.04 SUBMITTALS

A. Prior to procurement of valves, the Contractor shall submit to the Engineer for approval, complete sets of shop drawings of the equipment as required in Division 1, General Requirements, of these Specifications. Required drawings shall include complete outline drawings showing overall dimensions, the space requirements for installation and net weight of each valve. There shall be included section assembly drawings showing the general assembly of the valves and operators. Materials of component parts shall be identified by referring to standards of ASTM.

B. Prior to delivery, three certified copies of shop test reports shall be submitted to the Engineer for review. Acceptance or rejection of each item for delivery shall be based upon the results of these tests and no valve shall be released for shipment except after acceptance by the Engineer of test reports.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Gate valves shall be of the non-rising stem type with hand wheel operator for above ground installations or standard 2-inch square nut operator for buried installations. Valves shall be designed for operating pressure of 250 psi in accordance with AWWA C509.

B. Resilient wedge gate valves shall be ductile iron body. The wedge shall be ductile iron with guide bars or channels.

C. When open, the valve shall allow a full and unobstructed flow of water through the valve body. Reduced port gate valves shall not be allowed.

D. Materials.

1. All internal working parts (excluding wedge) shall be stainless steel or bronze containing not more than 11 percent aluminum or more than 5 percent zinc.

2. Trim shall be type 316 stainless steel.

3. Valve stems shall be cast or forged from bronze having a tensile strength of not less than 60,000 psi, a yield point of not less than 30,000 psi and an elongation of not less than 10 percent in 2 inches. Stem nuts shall be of bronze having a tensile strength of not less than 30,000 psi and a yield point of not less than 14,000 psi. Stem seals shall be of the “O” ring type,
providing at least two “O” rings in grooves; at least one above the thrust collar and one below in such a manner that the valve may be repacked under pressure in the full open position.

4. Rubber for the resilient seat shall be new, natural or synthetic of a compound designed for water service application, and shall be resistant to microbiological attack, copper poisoning, and ozone attack. Rubber seats shall be bonded to the wedge and fully encapsulated in accordance with ASTM D429 with peel strength of not less than 75 pounds per inch.

E. End Fittings and Operators. The end flanges for valves shall be flat-faced and shall conform in dimensions and drilling to ASME B16.1 for cast-iron flanges and flanged fittings, Class 250.

F. Gate valves 12 inches and smaller shall be AVK Series 45 (up to 16 inches), Mueller Co. 2300 Series, or an approved equivalent.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation of valve shall be in accordance with the manufacturer’s recommendations and details shown on the Drawings.

B. Valves delivered to the site shall be stored off of the ground. Seal open ends of valves being stored against entrance of dirt, debris, small animals and insects.

3.02 TESTING

A. Shop Testing. All valves shall be tested in conformance with the requirements of AWWA C509.

END OF SECTION
SECTION 11 28 20
COMBINATION AIR VACUUM AND AIR RELEASE VALVES

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment, appurtenances and incidentals required and install combination air vacuum and air release valves, complete, as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Steel Pipe and Fittings are included in Section 02 62 00.

B. Small Valves and Pipes are included in Section 02 64 20.

C. Shop Coating – Mechanical and Miscellaneous Items is included in Section 09 91 00.

1.03 SUBMITTALS

A. Shop Drawings

1. Submit to the Engineer, in accordance with Section 01 32 19, shop drawings of the equipment, equipment data and details, instruction manuals, and the name of the supplier. The shop drawings shall include complete outline drawings showing overall dimensions, the space requirements for installation and net weight of each valve. Section assembly drawings shall be included showing general assembly of the valves. Materials of component parts shall be identified by referring to standards of ASTM, ANSI, AWWA or other generally recognized standards.

2. Submit MTR for all major components, body, disc, shaft, etc. for verification conforming to applicable ASTM standards

B. Shop coating information and detailed data, including paint manufacturer and MDFT.

C. Color chart for exterior coating.
1.04 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)

1. ANSI/ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125 and 250

2. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through 24

B. American Society for Testing and Materials (ASTM)

1. ASTM A47 - Standard Specification for Ferritic Malleable Iron Castings

2. ASTM A48 - Standard Specification for Gray Iron Castings


5. ASTM A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

6. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes

7. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength


10. ASTM A582 - Standard Specification for Free-Machining Stainless Steel Bar

C. American Water Works Association (AWWA)

1. AWWA C550 - Standard for Protective Interior Coatings for Valves and Hydrants

D. Manufacturers Standardization Society (MSS)
1. SP-55 Quality Standard for Steel Castings for Valves, Flanges, and Fittings, and Other Piping Components
1.05 QUALITY ASSURANCE

A. Automatic air vacuum and air release valves shall be furnished by a single manufacturer who is experienced in the manufacture of the items to be furnished for a minimum of 5 years.

B. Attached isolation valves and piping appurtenances do not have to be manufactured by the automatic air vacuum and air release valve manufacturer and shall meet the requirements elsewhere in these Specifications.

1.06 DELIVERY AND HANDLING

A. Delivery, Handling and Storing

1. Valve shall be prepared for standard commercial shipment. Exterior of valve shall be protected from incidental damage during shipping and handling. Flange faces shall be covered to protect against damage during shipping, handling and storage.

2. Care shall be exercised in handling, loading, unloading and storing of valves to avoid distortion and damage to coatings. All valves shall be stored in the upright position or on a protective bunker or cushion and off the ground. Attached end (flange or threaded end) shall be covered to prevent entry of dirt and debris.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. General

1. Valve sizes and types shall be as shown on the Drawings and shall be suitable for potable water works service.

2. The valve assembly shall be Combination Vacuum Relief/Air Inlet and Air Release Valve (double body, double orifice) type. The valve shall automatically open to admit large volume of air into a system to break a vacuum when pipelines are being drained or are operating. Then valve shall close air tight, trapping the air as the system returns to positive pressure. While the large orifice is closed, the smaller size air release orifice shall remain open to slowly release trapped air in a controlled manner, to prevent water hammer and excess pressure surges.

3. All flanges shall be compatible to mating flanges.
4. The valve shall open when vacuum in the system exceeds 0.25 psi. Vacuum valves shall be equipped with a heavy flanged cover and entire air inlet opening shall be protected with a steel hood to prevent debris from entering the pipeline.

5. Valve internals shall be replaceable without removing the valve from the line.

B. Main Valve Material:

1. Body and Cover:
   a. Body shall be globe style made of cast iron conforming to ASTM A126, Class B or ductile iron conforming to ASTM A536, Gr 65-45-12. Body shall be integrally cast-on with flanged end for 3” and larger valve and threaded for smaller than 3” valve.
   b. Valve body shall have a 1” NPT opening with a plug for air release valve attachment.

2. Cover Bolts: Steel conforming to ASTM A307, Grade B

3. Plug and Seat: Bronze ASTM B584

4. Seat Needle: Buna-N

5. Float: Stainless steel conforming to ASTM A240

6. Hardware shall be stainless steel

7. Hood: Galvanized steel, painted

8. When the valve is open, the air passage at all points within the valve shall have a cross-sectional area equal to or greater than that through the inlet flange of the valve.

C. Air Release Valve:

1. The valve shall open when pressurized, allowing entrained air to escape from the pipeline through air release orifice. After entrained air escapes through the air release orifice, the valve orifice shall close by a needle mounted on the compound lever mechanism actuated by a float to prevent water from escaping.
2. The valve shall consist of a single bodied air release valve directly connected to the vacuum relief valve. Construction of the valve shall ensure a tight seal under low pressures.

3. Body: Body shall be globe style made of cast iron conforming to ASTM A126, Class B. Body shall be integrally cast-on with threaded end.

4. Cover: Cast iron conforming to ASTM A126, Class B

5. Cover Bolts: Steel conforming to ASTM A307, Grade B

6. Float: Stainless steel conforming to ASTM A240 T304

7. Float Lever and Lever Frame: Delrin D4181 or stainless steel conforming to ASTM 240 T304

8. Needle/Seat: Buna-N

9. Hardware shall be stainless steel.

10. The valve shall open when pressurized, allowing entrained air to escape from the pipeline through air release orifice. After entrained air escapes through the air release orifice, the valve orifice shall close by a needle mounted on the compound lever mechanism actuated by a float to prevent water from escaping.

11. Orifice size shall be 0.188" minimum.

12. The valve shall withstand at least 500 psi test pressure.

D. The valve shall have mushroom cap with built-in bug screen.

E. APCO: Series 1500C combination air vacuum and air release valve with Series 200A air release valve with 1” inlet.

2.02 PAINTING AND COATING VALVES AND APPURTENANCES

A. All coatings used on wetted surfaces shall be suitable for potable water service.

B. Wetted interior surfaces of valves shall be coated with liquid epoxy or fusion bonded epoxy in accordance with Section 09 91 00. The pipe connection openings shall be capped to prevent the entry of foreign matter prior to installation.

C. Exterior surface of exposed valves and appurtenances shall be shop coated with a complete paint system in accordance with Section 09 91 00. Color for
exterior coating shall be selected by the City. Submit color chart for the City's approval.
D. All gears, bearing surfaces and other surfaces not to be painted shall be given a heavy coat of grease or other suitable rust resistant coating unless otherwise specified herein. This coating shall be maintained as required to prevent corrosion during any period of storage and installation and shall be satisfactory to the City through the time of final acceptance.

2.03 PIPING, ISOLATION VALVES, AND APPURTENANCES

A. Unless otherwise shown, all connector piping between system main piping (component) and vacuum relief or air release valve shall be copper or brass.

B. All connector piping shall have at least one isolation valve of the same size as the pipe. Unless otherwise shown, all isolation valves on connector pipe shall be bronze.

C. All fittings and elbows to be installed along connector piping shall be bronze.

D. All other required appurtenances shall be brass, bronze, or stainless steel.

PART 3 - EXECUTION

3.01 INSTALLATION

Valves shall be installed in accordance with manufacturer's recommendations and as shown on Drawings.

3.02 FIELD PAINTING AND PROTECTIVE COATING

Shop applied coating, if damaged, shall be repaired in field per manufacturer's recommendations and Section 09 92 00.

END OF SECTION
SECTION 11 28 70
PUMP CONTROL VALVES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install pump control valves, complete as shown on the Drawings, as specified herein, and as required to complete the work.

B. Furnish and install all necessary guides, supports, limit switches, solenoid valves, pilot controls, and all other appurtenant accessories specified or required for the proper installation and operations of the valves.

1.02 RELATED WORK

A. Installation shall conform to the requirements of Division 2 and the requirements herein.

B. Painting and protective coating shall conform to the requirements of Division 9 and the requirements herein.

C. Electrical work is included in Division 16.

D. Instrumentation, Loop Descriptions, and SCADA systems are included in Division 17.

1.03 REFERENCE DOCUMENTS

A. American National Standards Institute (ANSI)
   1. ANSI/ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings
   2. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through 24

B. American Society for Testing and Materials (ASTM)
   1. ASTM A48 - Standard Specification for Gray Iron Castings
3. ASTM 276 - Standard Specification for Stainless Steel Bars and Shapes
5. ASTM A536 - Standard Specification for Ductile Iron Castings
6. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications

C. American Water Works Association (AWWA)
   1. AWWA C550 - Standard for Protective Interior Coatings for Valves and Hydrants

D. Manufacturers Standardization Society
   1. MSS SP-55 Quality Standard for Steel Castings for Valves, Flanges, and Fittings, and Other Piping Components

1.04 SUBMITTALS

A. Submit the following to the Engineer in accordance with Section 01 32 19.

1. List of materials and equipment to be furnished.

2. Shop drawings shall include diagrams, sketches and data which provide information on the overall dimensions, installation space requirements and the net weight of each valve. There shall also be included section assembly drawings showing the general assembly of the valve, properly identifying the various parts, components, composition and physical characteristics thereof by appropriate references to ASTM, ANSI, AWWA or other generally recognized standards.

3. Finishes of materials. Shop coating information and detailed data, including paint manufacturer and MDFT.

4. Technical data for all accessories to be provided including limit switches, solenoid valves, tubing, line valves, check valves, etc. as applicable.

5. Instruction manuals and operation and maintenance manuals for the valves.

6. Certificates. Prior to delivery, three certified copies of shop test reports shall be submitted to the Engineer for review. Acceptance or rejection of each item for delivery shall be based upon the results of these tests and no valve
shall be released for shipment except after acceptance by the Engineer of test reports.

7. Field test results.

1.05 MANUFACTURER'S SERVICE REPRESENTATIVE

A. Field Installation Services. The services of a qualified factory representative shall be provided to supervise and check the installation of the pump control valve and appurtenances to ensure the quality of the installation and proper operations. Additional field services shall be provided as per Section 01 64 00 as applicable.

B. Startup Services. The factory representative's services shall be provided during the facility startup. During startup operations, the factory representative shall ensure proper operation of all pump control valves and their components and make all necessary repairs and adjustments to controls and place the valves into service. Additional services during startup shall be provided as per Section 01 75 00 as applicable.

1.06 DELIVERY AND HANDLING

A. Marking:

1. Equipment shall bear identification markings that will remain legible during normal handling and storage. The marking shall be printed indelibly in ink or molded thereon in a manner that will not damage the equipment.

B. Delivery, Handling, and Storing:

1. All equipment, accessories, spares and fittings shall be prepared for standard commercial shipment unless otherwise specified.

2. Care shall be taken in loading, transporting, and unloading to prevent damage to the equipment. Equipment shall be delivered to the site properly secured on delivery trucks so as to prevent damage or excessive overhauling of the equipment. Handling shall be per manufacturer’s recommendations.

3. Storage of equipment shall be per manufacturer’s recommendations.

C. Additional requirements for delivery handling and storage are specified in Section 01 65 00.
PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. The pump control valve shall be hydraulically operated globe valve as shown on the Drawings, designed to operate in a clean potable water system. The valve shall be designed for a working pressure of 150 psig and shall incorporate a diaphragm designed to operate a stem and disc assembly such that hydraulic pressure applied to a chamber above the diaphragm will tend to close the valve and pressure applied below the disc will tend to open the valve.

B. Valve Application. The pump control valve shall be designed for installation on the discharge piping of pumps to eliminate starting and stopping surges caused by the pump operations. The valve shall be equipped with a built-in lift type check feature to prevent reverse flow, operating independently of the solenoid control.

C. On pump start up, the pump will start against the closed booster pump control valve. When the pump is started, the solenoid control shall be simultaneously energized and the pump control valve shall begin to open slowly, at a rate controlled by an opening speed control. Line pressure is gradually increased to full pumping head. When the pump is signaled to shut-off, the solenoid control shall first de-energized and the pump control valve shall begin to close slowly, at a rate control by a closing speed control. Flow is gradually reduced while the pump continues to run. When the pump control valve is nearing the fully closed position and flow rate is almost zero, a limit switch assembly affixed to the cover of the pump control valve, which serves as an electrical interlock between the valve and the pump, shall release the pump starter and the pump shall stop. Should a power failure occur while the pump is running, a built-in lift-type check valve shall close the moment flow stops, preventing reverse flow regardless of solenoid or diaphragm assembly position.

2.02 MATERIALS AND EQUIPMENT

A. Pressure rating of the valve shall be 150 psi minimum.

B. The valve body and cover shall be ductile iron conforming to ASTM A536. The bolt circle in the inlet and outlet flange shall be concentric with the water passage.

C. End Connections for control valve shall be flanged per ASME/ANSI B16.42, Class 150. Faces of flanges shall have a serrated finish of approximately 32 serrations per inch and approximately 1/64 inch deep. Serrations may be either spiral or concentric.
D. No separate chambers shall be allowed between the main valve cover and body. No fabrication or welding shall be used in the manufacturing process.

E. The valve shall contain a resilient, synthetic rubber disc, with a rectangular cross-section contained on three and one-half sides by a disc retainer, forming a tight seal against a single removable seat insert. No O-ring type disc (circular, square, or quad type) shall be permitted as the seating surface. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the disc firmly in place. The disc retainer shall be of a sturdy one-piece design capable of withstanding opening and closing shocks. It must have straight edge sides and a radius at the top edge to prevent excessive diaphragm wear as the diaphragm flexes across this surface. No hourglass-shaped disc retainers shall be permitted and no V-type or slotted type disc guides shall be used.

F. The diaphragm assembly containing a non-magnetic 303 stainless steel stem of sufficient diameter to withstand high hydraulic pressures shall be fully guided at both ends by a bearing in the valve seat. The seat shall be a solid, one-piece design and shall have a minimum of a five-degree taper on the seating surface for a positive, drip-tight shut off. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve separating operating pressure from line pressure.

G. The diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The center hole for the main valve stem must be sealed by the vulcanized process or a rubber grommet sealing the center stem hole from the operating pressure. The diaphragm must withstand a Mullins Burst Test of a minimum of 600 psi per layer of nylon fabric and shall be cycle tested 100,000 times to insure longevity. The diaphragm shall not be used as the seating surface. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully open or fully closed position.

H. The main valve seat and the stem bearing in the valve cover shall be removable. The cover bearing and seat shall be threaded into the cover and body. The lower bearing of the valve stem shall be contained concentrically within the seat and shall be exposed to the flow on all sides to avoid deposits. To insure proper alignment of the valve stem, the valve body and cover shall be machined with a locating lip. No “pinned” covers to the valve body shall be permitted. Cover bearing, disc retainer, and seat shall be made of the same material. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the
pipeline. Packing glands and/or stuffing boxes shall not be permitted and components including cast material shall be of North American manufacture.

I. All bosses in the valve body shall be drilled and tapped and openings not used shall be closed with bronze plugs. Cocks shall be provided in all connections at control piping to the body.

J. All internal metallic parts shall be stainless steel.

K. All piping between pilot control and Cla-Val body shall be braided stainless steel.

L. Pilot Control System:
   1. Solenoid pilot to be manufactured by control valve manufacture.
   2. The valve operation shall be controlled by an externally mounted pilot control system with a four-way solenoid operated pilot.
   3. Pilot system shall include four-way solenoid pilot valve. The solenoid shall be designed to operate on either AC or DC current and have a manual operator installed. Available power supply for the pilot system is shown on the drawings.
   4. The pilot control system shall also include a strainers, shut-off cocks, manual operators, shuttle valve and all required control accessories, equipment, control tubing and fittings. The pilot system shall include adjustable opening and closing speed control needle valves, utilized to prevent surging of the system on start-up and shut-down, and two limit switches.
   5. The pilot valve shall be of stainless steel. Strainer shall be provided in the control piping and connections to the valve body shall be made with cocks.
   6. The pilot shall be selected for the pressure setting specified and shall have a range from 0 psig to 450 psig.

M. Limit Switches. Two adjustable limit switches assembly shall be mounted on the main valve, connected to the main valve stem. One switch shall be actuated by opening of the valve and another by closing of the valve. The switch shall be easily adjusted to operate at any point of the valve’s travel.

N. Furnish pump control valve complete with all necessary guides, supports, limit switches, solenoid valves, pilot controls, and all other appurtenant accessories specified or required for the proper installation and operations of the valve.
2.03 PAINTING AND COATING VALVES AND APPURTENANCES:

A. All coatings used on wetted surfaces shall be suitable for potable water service.

B. Wetted interior surfaces of valves shall be coated with liquid epoxy or fusion bonded epoxy in accordance with Section 09 91 00.

C. Exposed valves and appurtenances shall be painted in conformance with Section 09 91 00. Color for exterior coating shall be selected by the City.

D. All gears, bearing surfaces and other surfaces not to be painted shall be given a heavy coat of grease or other suitable rust resistant coating unless otherwise specified herein. This coating shall be maintained as required to prevent corrosion during any period of storage and installation and shall be satisfactory to the City through the time of final acceptance.

2.04 MANUFACTURER AND MODEL:

A. The valve shall be Cla-Val Company, General Model No. 60-11, Booster Pump Control Valve meeting the requirements of this Section.

B. Regardless of the specified General Model number, the valve assembly shall include all required appurtenances, accessories, controls, and pilot system complete to perform the specified operations.

C. No substitute.

2.05 FACTORY ASSEMBLY:

A. Each control valve shall be factory assembled.

B. The Quality Management System of the factory shall be certified in accordance with ISO 9001.

C. For all control valves, the factory assembly shall include the complete main valve, pilot valve(s), and all associated accessories and control equipment.

2.06 NAMEPLATES:

A. Each Control Valve and associated pilot(s) shall be provided with an identifying nameplate.

B. Nameplates, depending on type and size of control valve, shall be mounted in the most practical position possible, typically on the inlet side of the valve body.

C. Nameplates shall be brass and a minimum of 3/32" thick, ¾" high and 2-3/4"
D. Pertinent control valve data shall be etched or stamped into the nameplate. Data shall include control valve Catalog number, function, size, material, pressure rating, end-connection details, type of pilot controls used and control adjustment range.

2.07 FACTORY TESTING:

A. Each control valve shall be factory tested.

B. Hydrostatic Test. Each valve shall be completely assembled and hydrostatically tested in the shop, using a test pressure equal to one and one-half times the specified water working pressure minimum. With both inlet and outlet openings of the valve closed by suitable heads, using full face gaskets and with the valve ring in a partly open position, the test pressure shall be maintained for not less than 10 minutes during which time the valve shall show no evidence of cracks, seepage or other defect.

C. Leakage Test. The valve seat shall be tested for leakage by applying the specified working water pressure on the upstream side of the seat, and this pressure shall be maintained for at least 15 minutes with the valve ring in the closed position. During this test, the valve shall be bottle tight.

D. Submit successfully completed and certified test reports to the Engineer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation of valve shall be in accordance with the manufacturer's recommendations, details shown on the Drawings and these Specifications.

B. Install valve drains and appurtenances as indicated and as required.

C. Unless more than one support is shown on the Drawings, provide at least one support for each valve in accordance with details shown on the Drawings.

3.02 PROTECTIVE COATING

Shop applied coating, if damaged, shall be repaired in field per manufacturer's recommendations and Section 09 92 00.
3.03 FIELD SETTING

A. The valve for Fire Pump shall be set to fully open over 3 minutes.

B. All other valves shall be set to fully open within approximately 1 minute and as finally determined in field.

3.04 FIELD TESTING AND SERVICES

A. Manufacturer's field services shall be provided in accordance with Sections 01 64 00 and as supplemented herein.

B. Valves shall be field tested after installation for proper operation and controls. Water tightness of each valve shall be checked following pressurization of the pipeline. Operation shall be satisfactory to the City.

C. During facility startup operations, manufacturer's representative(s) shall ensure proper operation of all check valves and make all necessary repairs and adjustments to provide a properly operating system.

D. Submit results of field testing to the City.

END OF SECTION
SECTION 11 28 80
REDUCED-PRESSURE PRINCIPLE BACKFLOW PREVENTERS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, appurtenances and incidentals required and install Reduced-Pressure Principle Backflow Preventers, complete as specified in the Contract Documents.

B. Valve Application. The valve will be used in water service pipelines for site irrigation system to ensure the prevention of cross contamination of potable water.

1.02 REFERENCE STANDARDS

A. American Society for Testing & Materials (ASTM)

   ASTM B61   Standard Specification for Steam or Valve Bronze Castings
   ASTM B62   Standard Specification for Composition Bronze or Ounce Metal Castings
   ASTM B584   Standard Specification for Copper Alloy Sand Castings for General Applications

B. American Water Works Association (AWWA)

   AWWA C511   Standard for Reduced-Pressure Principle Backflow-Prevention Assembly
   AWWA C550   Standard for Protective Interior Coatings for Valves and Hydrants

C. American Society of Safety Engineers (ASSE)

   ASSE 1013   Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers

1.03 SUBMITTALS
A. Shop Drawings. Prior to procurement of valves, the Contractor shall submit to the Engineer for approval complete sets of shop drawings of the equipment as required in Section 01 32 19. Required drawings shall include diagrams, sketches and data that provide information on the overall dimensions, installation space requirements and the net weight of each valve. There shall also be included section assembly drawings showing the general assembly of the valve, properly identifying the various parts, components, composition and physical characteristics thereof by appropriate references to ASTM, ANSI, AWWA or other generally recognized standards.

B. Protective painting and coating data,

C. Certificates. Prior to delivery, three certified copies of shop test reports shall be submitted to the Engineer for review. Acceptance or rejection of each item for delivery shall be based upon the results of these tests and no valve shall be released for shipment except after acceptance by the Engineer of test reports.

1.04 TESTING

Backflow prevention assemblies shall be tested by a tester approved by the County of Ventura Environmental Health Department on the form acceptable to that department. The contact information for approved testers may be found on the internet at:

https://docs.vcrma.org/images/pdf/eh/record-search/backflow_testers.pdf

1.05 OPERATION AND MAINTENANCE MANUAL

Submit operation and maintenance manuals in accordance with Section 01 32 19.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. General:

1. Backflow preventer shall be Reduce Pressure Zone Assembly type.

2. The assembly shall include a pressure differential relief valve, two positive seating check valves, springs and rubber seat discs, two unions, and two resilient seated isolation valves.

3. The check module seats and seat discs shall be replaceable.
4. All internal metal parts included in the mainline check assemblies shall be bronze or stainless steel.

5. Service of all internal components shall be through access cover(s) secured with stainless steel bolts.

6. Assembly shall be rated for at least 150 psi working pressure unless shown otherwise.

7. Assembly shall meet the requirements of ASSE 1013 and AWWA C511.

B. Assembly 2” and smaller shall have the following:
   1. Reduce pressure zone type assembly.
   2. Cast bronze body with lead free material.
   3. Locking handle ball valves.
   4. Union connections on each side.
   5. Four test cocks.
   7. Model LFU009 as manufactured by WATTS or approved equal by FEBCO.

C. Prior to completion of the work, deliver to the City, one set of the following spare parts and repair kit for each 2” and smaller assembly installed.
   1. Disc assembly
   2. Spring
   3. Seat O-ring
   4. Cover O-ring
PART 3 - EXECUTION

3.01 VALVE INSTALLATION

Valve shall be installed as shown on the Drawings and in accordance with manufacturer’s recommendations. Valves shall be installed true and plumb as indicated. Provide valve drains and appurtenances as indicated and as required.

3.02 FIELD INSTALLATION AND TESTING

A. Installation of valve shall be in accordance with the manufacturer’s recommendations, details shown on the Drawings, and these Specifications.

B. Assembly shall be installed at least 12” above the finished grade.

C. Unless more supports are shown on the drawings, at least one support shall be installed for the assembly.

D. Any damage to coating shall be repaired.

E. The assembly shall be tested in field for proper installation and operation. Test report shall be submitted to the Engineer.

END OF SECTION
SECTION 11 30 00
ELECTROMAGNETIC FLOW METER

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, appurtenances and incidentals required and install electromagnetic flow meter for potable water flowing through pump discharge pipe as shown on the Drawings, as required, and as specified herein.

B. Furnish and install all necessary accessories and appurtenances specified or required for the proper installation and operation of the flow meter.

1.02 RELATED WORK

A. Installation shall conform to the requirements of Division 2 and the requirements herein.

B. Painting and protective coating shall conform to the requirements of Division 9 and the requirements herein.

C. Electrical work is included in Division 16.

D. Instrumentation, Loop Descriptions, and SCADA systems are included in Division 17.

1.03 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)

1. ANSI/ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250

2. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through 24

B. NEMA – Applicable Standards, including 4X/6P (IP66/IP67)

C. NSF/ANSI Standard 61
1.04 SUBMITTALS

A. Submittals shall be done in accordance with Section 01 32 19 and include the following at a minimum.

1. Manufacturer’s catalog and detail technical data, including identifications of key components, outline dimensions, conduit entry locations, weight, list of material, performance data, accuracy, and other similar data.

2. Customer connection and power wiring diagrams.

3. Data sheets and catalog literature for microprocessor-based transmitter and transducer.

4. Interconnection drawings.

5. Installation and operations manual.


7. Complete technical product description including a complete list of options provided.

PART 2 – PRODUCTS

2.01 MANUFACTURERS AND MODELS

A. Basis-of-Design Product: Subject to compliance with specifications, provide flow measurement equipment by one of the following:

1. Badger Meter, Model M2000 with required accessories and appurtenances.

2. Approved equal.

2.02 SYSTEM COMPONENTS AND OPERATION REQUIREMENTS

A. The flow meter system shall operate with a pulsed DC excitation frequency, and shall produce a signal output that is directly proportional and linear with the volumetric flow rate of the liquid flowing through the metering tube. The metering system shall include a metering sensor tube (detector), a signal amplifier, and the necessary connecting wiring. The metering system shall have the ability to incorporate a meter mounted or remote mounted amplifier.

B. Engineering Units: The signal amplifier shall be program selectable to display U.S. gallons.
C. Operating Principle: The unit shall operate under electromagnetic induction principle.

D. Metering Tube (Detector)

1. The metering tube (detector) shall be constructed of 316 stainless steel, and rated for a maximum allowable non-shock pressure and temperature for steel pipe flanges, according to ANSI B16.5.

2. The metering tube (detector) diameter shall be as shown on the Drawings.

3. The metering tube (detector) end connections shall be stainless steel flanged, according to ANSI B16, Class 150 and AWWA Class B standards.

4. The insulating liner material of the metering tube (detector) shall be made of a hard rubber elastomer and NSF-listed for meter sizes 4” and above. Provide insulating flange assembly with adjoining steel piping.

5. The metering tube (detector) shall include two self-cleaning measuring electrodes. The electrode material shall be corrosion resistant 316 stainless steel.

6. The metering tube (detector) shall include a third “empty pipe detection” electrode located in the upper portion of the inside diameter of the flow tube in order to detect an empty pipe condition when the flow tube is running partially empty.

7. The metering tube (detector) housing shall be rated for NEMA 4X/6P (IP66/IP67) ratings.

8. For remote amplifier applications, the metering tube (detector) junction box enclosure shall be constructed of cast aluminum with powder-coated paint and shall meet NEMA 4X/6P (IP66/IP67) ratings.

9. When installed in non-metallic or internally lined piping, the metering tube (detector) shall be provided with a pair of corrosion resistant grounding rings. The grounding ring material shall be 316 stainless steel.

10. Fluid Temperature Range: Fluid temperature range shall be 32°F to 178°F at a maximum ambient temperature of 122°F for the hard rubber liner material.
E. Signal Amplifier

1. The signal amplifier shall be microprocessor based, and shall energize the detector coils with a digitally controlled pulsed DC. The excitation frequency shall be program selectable for the following: 1Hz, 3.75Hz, 7.5Hz, or 15Hz. (factory optimized to pipe size and application)

2. The signal amplifier electrical power requirement shall be 120VAC. The power consumption shall not exceed 15W.

3. The signal amplifier shall have an ambient temperature rating of -4°F to 140°F.

4. The signal amplifier shall include non-volatile memory capable of storing all programmable data and accumulated totalizer values in the event of a power interruption.

5. Automatic zero stability, low flow cut-off, empty pipe detection and bi-directional flow measurement shall be inherent capabilities of the signal amplifier.

6. All signal amplifier outputs shall be galvanically isolated to 250 volts.

7. The signal amplifier and remote junction enclosures shall be constructed of cast aluminum with powder-coated paint and shall meet NEMA 4X/6P (IP66/IP67) ratings.

8. Outputs:

    The signal amplifier shall provide a total of four digital outputs, one analog output and one digital input.

    a. Up to four open collector digital outputs, program selectable from the following: Forward pulse, reverse pulse, AMR pulse, flow set point, empty pipe alarm, flow direction, reset output, error alarm and 24V supply.

    b. Up to two active digital (24 Volt) outputs, program selectable from the following: Forward pulse, reverse pulse, AMR pulse, flow set point, empty pipe alarm, flow direction, preset output, error alarm and 24V supply.

    c. Up to two AC solid-state relay outputs, program selectable from the following: Frequency output, flow set point, empty pipe alarm, flow direction, preset amount and error alarm.

    d. One digital input, program selectable from the following: Remote reset, batch reset and positive return to zero.

    e. Advanced protocol support using Modbus/RTU.
f. One analog output programmable and scalable from the following: 0-10mA, 0-20mA, 2-10mA or 4-20mA. Voltage sourced and isolated. Max. loop resistance = 800 ohms.

F. Control and Programming

1. The signal amplifier shall be programmed via three function buttons. The programming functions shall be available in a user-friendly, menu driven software through the LCD interface.

2. Programmable parameters of the amplifier include, but are not limited to, calibration factors, totalizer resets, unit of measure, analog and pulse output scaling, flow-alarm functions, language selection, low-flow cutoff, noise dampening factor and excitation frequency selection.

3. The signal amplifier shall have a programming option allowing entry of a selected numeric password value for tamper protection.

G. System Performance

1. The metering system shall operate over a flow range of 0.10 to 39.4 ft/s.

2. The metering system shall perform to an accuracy ± 0.25 percent of rate for velocities greater than 1.64 ft/s and ± 0.004 ft/s for velocities less than 1.64 ft/s.

3. The system measuring repeatability shall be <0.10% of full scale.

a. Indication: The signal amplifier shall include a four-line, 20-character, backlit LCD interface to display the following values:

   i. Flow rate in selectable rate units
   ii. Forward totalizer in selectable volume units
   iii. Reverse totalizer in selectable volume units
   iv. Net totalizer in selectable volume units
   v. Error or alarm messages
   vi. Software revision level
PART 3 - EXECUTION

3.01 INSTALLATION

A. Install flow meter components in accordance with manufacturer’s recommendations.

B. Flow meter shall be installed at location shown on the Drawing. Flow meter shall have straight pipe reach an equivalent of three diameters on the inlet (upstream) side, and two diameters on the outlet (downstream) side.

C. Signal amplifier shall be installed inside the new pump station building at location approved by the City.

3.02 CALIBRATION

A. Each meter shall be hydraulically calibrated in an ISO 9000-certified testing facility, which utilizes a computerized gravimetric testing method with a measuring uncertainty of 0.1%.

B. Each meter shall be provided with a calibration certificate indicating the measured error (percent deviation) at three different flows, respectively equivalent to 25%, 50% and 75% of the nominal flow rate for each size.

3.03 FIELD PAINTING AND PROTECTIVE COATING

Shop applied coating, if damaged, shall be repaired in field per manufacturer’s recommendations and Section 09 92 00.

3.04 FIELD SERVICES

A. Manufacturer’s field services shall be provided in accordance with Sections 01 64 00 and as supplemented herein.

B. Flow meter shall be field tested after installation for proper operation and communication. Provide required assistance to the Contractor to ensure proper integration with HMI, PLC and SCADA system. Operation and communication shall be satisfactory to the City in all respects.

C. During startup operations, manufacturer’s representative(s) shall ensure proper operation of all flow meters and make all necessary repairs and adjustments if required.

END OF SECTION
SECTION 15 05 50
AIR COMPRESSORS

PART 1 - GENERAL

1.01 SCOPE OF WORK
Furnish all labor, materials, equipment and incidental required, and install air compressor(s), including air piping and appurtenances as shown on the Drawings as specified herein, and as required to complete the work.

1.02 SUBMITTALS
A. Shop Drawings
   1. Submit in accordance with Section 01 32 19 shop drawings of the equipment and equipment data, details, and performance data. The shop drawings shall include complete outline drawings showing overall dimensions and the space requirements for installation. There shall be included diagrams showing general wiring and connections.
   2. Shop coating information and detailed technical data.
   4. Field test report.

1.03 REFERENCE DOCUMENTS
All electrical components of the air compressor shall meet NEMA 4 requirements.

1.04 RELATED WORK
A. Small Pipes and Valves are included in Section 02 64 20.
B. Hydropneumatic Surge Control Tank System is included in Section 15 20 00.
C. Basic Electrical Material and Methods are included in Section 16 05 00.

1.05 MANUFACTURER’S SERVICES
A. Field Installation Services. The services of a qualified factory representative shall be provided to supervise and check the installation of the air compressor.
and appurtenances to ensure the quality of the installation. Additional field services shall be provided as per Section 01 64 00 as applicable.

B. Startup Services. The factory representative’s services shall be provided during the facility startup. During startup operations, the factory representative shall ensure proper operation of all air compressor components and make all necessary repairs and adjustments to provide a properly operating system. Additional services during startup shall be provided as per Section 01 75 00 as applicable.

PART 2 - PRODUCTS

2.01 AIR COMPRESSOR

A. General:

1. The entire unit assembly shall be the product of one manufacturer engaged in the manufacture of quality compressor.

2. The air compressor shall be a two stage, air-cooled, base mounted unit and shall be furnished complete with intake muffler and filter, drive sheave, V-belt drive, belt guard and electric motor. Provision for belt tightening shall be included.

3. Air compressor shall have no tank.

4. The air compressor shall be suitable and rated for outdoor installation, NEMA 4.

B. Detail Requirements. The unit shall have the following features.

<table>
<thead>
<tr>
<th>HP</th>
<th>3 to 5 as required</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFM min.</td>
<td>7 at 125 psi</td>
</tr>
<tr>
<td>Max. Pressure</td>
<td>175 psi</td>
</tr>
<tr>
<td>Tank Type and Size</td>
<td>None</td>
</tr>
<tr>
<td>Electrical Power</td>
<td>480VAC, 3 Phase, 3 Wires</td>
</tr>
</tbody>
</table>

C. The motor shall be totally enclosed fan cooled (TEFC), drip proof type, 480VAC, 3 phase, class B insulation, 1.15 service factor, grease lubricated bearings and shall conform to NEMA standards.

D. Compressor shall be equipped with an inter-cooler and pressure relief valve to prevent over pressurization. Compressor and motor shall be mounted on heavy steel base. The steel base shall be fastened to the concrete floor with
anchor bolts.
E. Air compressor shall have the following features:

1. NEMA 4 rated unit
2. Low oil level switch
3. Start-up kit
4. Auto drain valve
5. Filter silencer
6. Air-cooled after-cooler

F. The entire air compressor unit shall be enclosed in a fabricated galvanized sheet metal enclosure as shown on the Drawings. Dimensions of the enclosure shown on the Drawings are minimum. The Contractor shall provide larger enclosure and concrete pad as required to accommodate the air compressor unit.

G. Air compressor shall be as manufactured by Ingersoll Rand Model 2340 or approved equivalent.

H. Furnish air pressure gauge and associated tubing, galvanized mounting bracket and hardware.

PART 3 - EXECUTION

3.01 INSTALLATION AND TESTING

A. Air compressor shall be installed as shown on the drawings and in accordance with the manufacturer's recommendations.

B. Install all required piping, valves, anchors, electrical conduits, receptacles, and appurtenances as required to provide a complete and functional system. Make all required connections including electrical and air piping. Air piping shall be connected to the surge tank on the site.

C. Unless otherwise shown on the drawings, air compressor shall be installed on a concrete pad and inside a metal enclosure.

D. Air pressure gauge shall be installed on the wall adjacent to the air compressor unit as directed by the City in the field. Install all required brackets, channels, and hardware.
E. Air compressor shall be tested in field in presence and to the satisfaction of the City. Air compressor operation shall be tested based on water level control at the surge tank.

F. Submit field test report to the Engineer.

3.02 PAINTING

A. All exposed ferrous metal surfaces of the unit, except wearing surfaces, shall be provided with a suitable, shop applied, machinery enamel finish.

B. All exposed ferrous metal surfaces of the unit that are only shop primed, except wearing surfaces, shall be provided with a suitable, field applied, paint in accordance with Section 09 92 00.

END OF SECTION
SECTION 15 20 00
HYDROPNEUMATIC SURGE CONTROL TANK SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment, and incidentals required and install hydropneumatic surge tank system, including hydropneumatic surge tank, tank supports, air compressor, air piping, valves, gauges, instrumentation, accessories, and appurtenances, complete as shown on the Drawings, as specified herein and as required to complete the work.

1.02 RELATED WORK

A. Steel Pipe and Fittings are included in Section 02 62 00.
B. Small Valves and Pipes are included in Section 02 64 20.
C. Water Pipeline Testing and Disinfection are included in Section 02 66 00.
D. Shop Coating is included in Section 09 91 00.
E. Field Painting and Protective Coating are included in Section 09 92 00.
F. Air Compressor is included in Section 15 05 50.
G. Electrical Work is included in Division 16.
H. Instrumentation is included in Section 17 40 00.

1.03 SUBMITTALS

A. Submit the following to the Engineer in accordance with Section 01 32 19:

   1. Surge Tank Data:

      a. Shop drawings showing plan, sections, and details of the surge tank and tank components. Material type, thicknesses, and corresponding ASTM standards.
b. Assembly drawings showing locations and sizes of outlets for piping connections, access manhole, sight gauges, valves, level probes, and operators.

c. Design calculations for tank shell, tank head, and tank support and anchors. Pressure vessel calculations shall be in accordance with ASME Section VIII of the ASME Boiler and Pressure Vessel Code for Unfired Pressure Vessel. Calculations shall be stamped by a Professional Engineer registered in the State of California.

d. Design calculations and fabrication details for tank support system including anchorage requirement. Calculations shall be stamped by a Professional Engineer registered in the State of California. Support and anchors shown on the Drawings are minimum requirements.

e. Tank capacity. Tank weights when empty and full of water.

f. Materials of component parts shall be identified by referring to standards of ASTM.

g. Shop and field coating information and detailed data, including paint manufacturer and MDFT. Provide color charts for City’s selection.

2. Air Compressor and Controls:

a. Air compressor and its submittal shall be in accordance with Section 15 05 50.

3. Air Piping System:

a. Air piping system layout plan, including location of isolation and check valves, unions, etc.

b. Material data for piping, appurtenances, straps, and accessories.

c. Manufacturer’s data for isolation, and check valves.

4. Water Tube and Electrode Holder Assembly:

a. Water tube material, sizes, and dimensions.

b. Ball valve data.

c. Electrode holder and electrode data.
5. Pipe Expansion Joint (Bellow): Manufacturer’s technical data, fabrication details, and shop coating data.


7. Surge Tank Shop Test Reports: Prior to delivery of the surge tank, submit three certified copies of shop test reports for review and approval.

8. Instrumentation test and calibration reports.


1.04 REFERENCE STANDARDS

A. American Society of Mechanical Engineers (ASME)
   1. ASME Boiler and Pressure Vessel Code

B. American National Standards Institute (ANSI)
   1. ANSI B1.20.1 - Pipe Threads, General Purpose

C. American Society for Testing and Materials (ASTM)
   1. ASTM A182 - Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
   2. ASTM AB62 - Standard Specification for Composition Bronze or Ounce Metal Castings
   3. ASTM A516 - Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service

D. National Fire Protection Association (NFPA)
   1. NFPA 70 - National Electrical Code (NEC), 2014 Edition

1.05 QUALITY ASSURANCE

The manufacturer of the surge tank control system equipment shall have not less than five years of experience in designing and manufacturing of similar systems.

1.06 MANUFACTURERS’ SERVICES
A. Field Installation Services:

1. The services of a qualified factory representative(s) shall be provided to supervise and check the installation of the surge tank, air piping, and its appurtenances to ensure the quality of the installation, adjust controls, and place unit in operation.

2. Perform field tests.

3. Field services shall be provided in accordance with Section 01 64 00.

B. Startup Services:

1. Services of the manufacturer’s representative shall be provided during the facility startup at the request of the City. During startup operations, the manufacturer’s representatives shall ensure proper operation of all air piping system, surge tank, electrodes, and pertinent appurtenances and alarms.

PART 2 - PRODUCTS

2.01 GENERAL

A. The hydropneumatic surge control tank system shall consist of the following:

1. Surge tank and appurtenances.

2. Water tube and electrodes.

3. Air compressor per Section 15 05 50.

4. Air piping, fittings, unions, elbows, and appurtenances.

5. Isolation and check valves.

6. Pressure gauges.

7. Safety relief valves and accessory valves.

8. Pipe flexible joint.

9. Supports, clamps, anchors, and hardware.
10. All appurtenances and accessories required for complete installation and operation.

2.02 SYSTEM DESIGN REQUIREMENTS

A. Surge tank volume and content: 180 cubic feet minimum, potable water

B. Surge tank diameter and length: 5'-6" feet diameter, length as required, but not less than 8 feet

C. Minimum design pressure: 200 psi

D. Safety valve pressure setting: 170 psi

E. Initial air volume in the surge tank at steady state conditions: Approximately 35% at approximately 80 psi

2.03 SURGE TANK AND APPURTENANCES

A. Surge tank volume, dimensions, and pressure rating: In accordance with Paragraph 2.02.

B. The minimum shell and head plate thicknesses shall be in accordance with the calculations, but not less than shown on the Drawings. Surge tank shall have a corrosion allowance of 1/16 inch in the required metal thickness. Surge tank material shall be of carbon steel ASME SA516-70 or an approved equal. All joints shall be welded.

C. Surge tank shall have the following appurtenances. Sizes and locations shall be as shown on the Drawings.

1. One access shell manhole.

2. Outlet for surge piping.

3. Outlets for water tube connections.

4. Outlets for valves, air piping, gauges, and other similar instruments.

5. Lifting eyes as required by the manufacturer for handling and installation.

D. Surge tank support system shall be provided in accordance with the design calculations. Thicknesses of support members and anchor sizes shall not be less than those shown on the Drawings.
E. Shell Manhole(s): Shell manhole shall be boiler type, suitable for water service, and shall be of the sizes indicated on the drawings. Closure shall have WOG working pressures as required or indicated. Warning devices as required by ASME Code shall be mounted on the closure covers.

F. Surge tank shall be shop coated with a complete epoxy system in accordance with Section 09 91 00. Interior coating shall be conforming to NSF 61 Standard for potable water. Surge tank exterior surfaces shall be shop prime coated in accordance with Section 09 91 00 and field coated in accordance with Section 09 92 00.
2.04 MISCELLANEOUS MATERIALS AND PIPING

A. Unless otherwise shown, all materials, instruments and appurtenances to be incorporated or connected to the surge control system shall be rated for 150 psi minimum working pressure.

B. Ball valves and check valves: Small ball and check valves shall be bronze and in accordance with Section 02 64 20.

C. All tubing, including air piping, shall be copper or brass in accordance with Section 02 64 20.

D. All fittings, unions, elbows, and couplings shall be bronze in accordance with Section 02 64 20.

E. Safety-relief valve shall comply with the ASME Boiler and Pressure Vessel Code. Valve shall be bronze and shall have a pressure rating of at least 400 psig WOG. Valve shall have a bottom NPT inlet, and shall incorporate a calibrated spring set to allow the valve to open at the tank design pressure. Valve shall be Kingston Model 119C or approved equal.

F. Pressure gauges shall be in accordance with Section 17 40 00.

G. Instrument Mounting Material:
   1. Provide required mounting material as recommended by the manufacturer to properly mount instruments and equipment.
   2. Provide galvanized mounting system comprised of posts, channels, struts, brackets, U-bolts, clamps, flanges, base plates, and stainless steel hardware and anchors as required.

2.05 AIR COMPRESSOR

Air compressor shall be provided under Section 15 05 50.

2.06 ELECTRODES AND ELECTRODE HOLDER

A. The electrodes shall be wire suspended probes. Probe shall be Type 316 stainless steel. Wire shall be PVC coated and suspended from electrode holder. Electrode shall be Series 3W as manufactured by Charles F. Warrick or approved equal.

B. The electrode holder shall have capacity to accommodate at least four total electrodes, two level probes and one reference probe. The electrode holder
shall be series 3E with a body material of red brass as manufactured by Charles F. Warrick or approved equal.

C. Provide all required adapters, tubing, and hardware for a compete assembly.

2.07 PIPE EXPANSION JOINT (BELLOWS)

A. Pipe expansion joint shall be furnished on the inlet to the surge tank as indicated on the Drawings. Size shall be as shown on the Drawings.

B. The materials shall be stainless and must comply with the hydraulic condition shown in the Paragraph 2.02.

C. Pipe expansion joint shall be thrust restrained.

D. Pipe expansion joint shall be as supplied by Hyspan, Series. l501, with SS 304SS bellows, tie rods, and hardware, carbon steel flanges, 150 psig rated, or an approved equal.

PART 3 - EXECUTION

3.01 FACTORY TESTS

A. The tank shall be tested to a pressure of 150% of ASME design pressure, per the requirements of Section VIII of the ASME Boiler and Pressure Vessel Code for Unfired Pressure Vessels.

B. All instruments shall be factory tested in accordance with the manufacturer's requirements.

3.02 INSTALLATION

A. The surge tank and appurtenances shall be installed as shown on the Drawings an in accordance with approved shop drawings.

B. Air piping shall be installed as shown on the Drawings. For aboveground piping, install copper or stainless steel pipe straps at 5 feet on center maximum. Install required supports, tubing, and clamps to support piping, valves, and appurtenances. All hardware shall be stainless steel.

C. All electrical and communication work shall be installed in accordance with manufacturer’s recommendations and the requirements of Division 16.
D. Instruments:

1. Field instruments shall be mounted in accordance with manufacturer's recommendations.

2. See Section 17 40 00 for additional requirements for installation of instruments.

3.03 FIELD TESTING

A. Test surge control system components, including compressor for their proper operations and settings.

B. Calibrate and test all instruments in accordance with Section 17 40 00.

C. Submit reports of all field calibration and testing to the City.

3.04 FIELD PAINTING AND PROTECTIVE COATING

A. If interior coating system of the surge tank or any other shop applied complete coating system is damaged, it shall be repaired in accordance with Section 09 92 00.

B. Field painting of shop primed surfaces shall be performed in accordance with Section 09 92 00.

END OF SECTION
SECTION 15 32 00
EXHAUST FANS

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment, appurtenances and incidentals required and install heavy-duty, axial wall direct driven fan with wall shutter and accessories complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Metal Fabrications are included in Section 05 50 00.
B. Electrical Work is included in Division 16.

1.03 SUBMITTALS

A. Submit the following to the Engineer in accordance with Section 01 32 19.
   1. List of materials and equipment to be furnished.
   2. Shop drawings and equipment data showing dimensions, weights, capacities, performance rating, installation instructions and other pertinent data.
   3. Finishes of materials.
   4. Instruction manuals and operation and maintenance manuals. At a minimum, the required manuals shall include instructions for installation, lubrication, motor and drive replacement, spare parts list and wiring diagrams.
   5. Fan performance curves with operating point clearly plotted.
   6. Sound power levels for fan at both inlet and outlet at rated capacity.

1.04 REFERENCE STANDARDS

A. Air Movement and Control Association, Inc. (AMCA)
   1. AMCA 99 Standards Handbook
2. AMCA 210 Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating
3. AMCA 300 Reverberant Room Method for Sound Testing of Fans
4. AMCA 301 Methods for Calculating Fan Sound Ratings from Laboratory Test Data

B. American Bearing Manufacturers Association (ABMA)
   1. ABMA 9 Load Ratings and Fatigue Life for Ball Bearings
   2. ABMA 11 Load Rating and Fatigue Life for Roller Bearings

C. National Fire Protection Association (NFPA)
   1. NFPA 90A Standard for the Installation or Air Conditioning and Ventilating Systems

D. Underwriters Laboratories (UL 705) Standard for Safety Power Ventilators

1.05 QUALITY ASSURANCE

A. Fan shall bear the AMCA certified ratings seal for sound and air performance.
   1. Fan performance rating: Conforming to AMCA 210 (and bearing the AMCA certified rating seal).
   2. Sound Ratings: Conforming to AMCA 301; AMCA 300 (and bearing AMCA certified sound seal)
   3. Fabrication: Conforming to AMCA 99 and ARI 430

1.06 DELIVERY AND HANDLING

A. Marking:
   1. Equipment shall bear identification markings that will remain legible during normal handling and storage. The marking shall be printed indelibly in ink or molded thereon in a manner that will not damage the equipment.

B. Delivery, Handling, and Storing:
   1. All equipment, accessories, spares and fittings shall be prepared for standard commercial shipment unless otherwise specified.
2. Care shall be taken in loading, transporting, and unloading to prevent damage to the equipment. Equipment shall be delivered to the site properly secured on delivery trucks to prevent damage or excessive overhauling of the equipment. Handling shall be per manufacturer’s recommendations.

3. Storage of equipment shall be per manufacturer’s recommendations.

4. Protect motors, shafts, and bearing from weather and construction dust.

C. Additional requirements for delivery handling and storage are specified in Section 01 65 00.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENTS

A. General:

1. Fan shall be a wall mounted, direct driven, heavy-duty aluminum propeller exhaust fan with integral housing, shutter, and inlet guard.

2. Fan shall be manufactured at an ISO 9001 certified facility and listed by UL 705.

3. Fan shall be provided with all required accessories and appurtenances, including mounting members and hardware as shown on the Drawings and as required for adequate installation and proper operation.

B. Exhaust fans shall be as manufactured by Loren Cook Company or approved equivalent. Exhaust fans shall be of model nos. and capacities as specified below and it shall meet the requirements of this Section. The quantity and locations of each type of exhaust fan shall be as shown on the Drawings.

<table>
<thead>
<tr>
<th>Fan Model</th>
<th>Nominal Size</th>
<th>Min. CFM at 0.25” w.g.</th>
<th>Min. Horse Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPD-24SP10D</td>
<td>24”</td>
<td>2000</td>
<td>1/2 HP</td>
</tr>
</tbody>
</table>

Notes:
1. Fan assembly shall meet all other requirements specified in this Section.

C. Construction:

1. Fan shall be of bolted and welded construction utilizing corrosion resistant fasteners.
2. The motor shall be mounted on a 12-gauge steel wire guard.

3. The wire guard shall be bolted to a minimum 14-gauge wall panel with continuously welded corners and an integral venture.

4. Fan shall be enclosed in minimum 18 gauge galvanized steel wall housing with factory installed shutter and inlet guard.

5. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM and static pressure.

D. Propeller shall have aluminum circular-arc blades welded to spherical hub and precision balanced on corrosion resistant coated fan shaft.

E. Fan shall be statically and dynamically balanced to eliminate vibration and noise transmission. Open type sleeve bearing shall be used. Bearing shall be resilient mounted in neoprene ring providing protection and vibration isolation.

F. Motor shall be open drip proof type with sealed ball bearing types matched to fan load. Power supply to fan shall be single phase 120 VAC. Fan motor shall be non-overloading through the entire range of operation Electrical motors shall be listed by UL and conform to NEMA standards.

G. Coating:

1. All steel fan components shall be coated with an electrostatically applied, baked polyester powder coating.

2. Each component shall be subject to a five-stage environmentally friendly wash system, followed by a 1.5 to 2.5 mils thick baked powder finish.

3. Paint must exceed 1,000-hour salt spray under ASTM B117 test method.

H. A lockable, NEMA-rated disconnect switch shall be factory installed and wired to the fan motor as standard 120V, Single Phase.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Contractor and manufacturer of the exhaust fan shall coordinate with each other for required rough wall opening for fan installation.

B. Fan shall be installed at locations shown on the Drawings and in accordance with the manufacturer's recommendations.
C. Install all required support system as recommended by the manufacturer for securing fan assembly. Install additional supports and hardware as required to adequately secure the exhaust fan unit.

D. Alignment: Equipment shall be properly aligned and operate free from defects including binding, scraping, vibration, end-shaft runout, or other defects. Equipment shall be bolted in position and neat in appearance.

E. Install disconnect switch per Drawings.

F. Do not operate fans for any purpose until all work is clean, accessories are in place, bearing lubricated, and fan has been test-run under City’s observation.

G. Provide all accessories required for final air balance and complete installation.

**3.02 PERFORMANCE TESTING**

A. After the completion of installation, each fan shall be tested in accordance with the manufacturer’s recommendations to demonstrate compliance with the performance requirements as specified.

B. Testing procedures shall duplicate, as nearly as possible, the conditions of operation and shall be selected to demonstrate that the equipment is operational and free from damage.

C. Each mechanical and electrical part shall demonstrate that the equipment has been properly aligned, connected, and calibrated prior to operation.

**END OF SECTION**
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SECTION 16 00 00

ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install complete and make operational, electrical systems as shown on the Drawings and as specified herein.

B. The Work shall include furnishing, installing, commissioning, and testing the electrical materials and components necessary for operation of all equipment specified for the Work, as well as coordinating and administering performance and acceptance testing of all such equipment and coordinating, preparing, and submitting all associated studies and reports.

C. Coordinate with Southern California Edison (SCE) to obtain approval for shop drawings and test reports, installation of new equipment and modifications to existing facilities that would affect SCE system.

D. Electrical equipment shall be designed, furnished, and installed to suit the available space.

E. Electrical work shall be performed by a qualified Electrical Contractor(s) with C10 license.

1.02 DEFINITIONS

A. Electrical Drawings – That portion of the Drawings that shows any elements of electrical, controls, or communication systems.

B. Electrical Contractor – The Contractor or his Subcontractor performing the electrical work.

1. The Electrical Contractor places, installs, erects, or connects any electrical wires, fixtures, appliances, apparatus, raceways, conduits, solar photovoltaic cells, or any part thereof, which generate, transmit, transform, or utilize electrical energy in any form or for any purpose.

2. The Electrical Contractor shall be licensed as a C10 Electrical Contractor under California Code of Regulations, Title 16, Division 8, Article 3, Classifications.
3. The Electrical Contractor shall designate an individual to act as the Electrical Foreman, who shall be responsible for overseeing and supervising all electrical work; coordinating and integrating all electrical, distributed control, and instrumentation work; and handling the testing and facility startup activities associated with these systems.

1.03 SUMMARY

A. Requirements specified within this section shall apply to all Sections within these Specifications. Work specified herein shall be performed as if specified in the individual sections.

B. Provide all required labor, equipment, and materials, and satisfactorily complete all electrical work shown on the Drawings, included in these Specifications, and required for a complete and fully operational facility.

C. It is the intent of these Contract Documents that the electrical systems shall be suitable in every way for the service required. All materials and all work that may be required as being incidental to the work of this Section shall be furnished at no additional cost to the City.

D. Provide all conduits, wires, and instrumentation cables necessary for connections of instruments and controls specified on the drawings and individual sections.

E. Provide conduits and wires for power and control of all auxiliary devices, such as solenoid valves, actuators, operators, pressure switches, and instruments, that are included as integral parts of manufacturers’ packaged systems regardless of which section of the Specifications describes them. Contractor shall be responsible for conduits and wires to these auxiliary devices even if they are not specifically shown on the Drawings or specified herein.

F. All equipment anchoring and mounting shall be in accordance with the California Building Code, including seismic requirements. All equipment designed to be fixed in position shall be securely fastened in place. For all equipment with (1) an operating weight of 400 pounds or more or (2) specifically identified in the Specifications for anchorage calculations, detailed engineering anchorage calculations and figures shall be submitted to the Engineer. For equipment weighing less than 400 pounds, the equipment manufacturer shall provide recommended anchorage information to the Contractor for use in the installation of the equipment.

G. Conduct all operations in accordance with NFPA 70E, Standard for Electrical Safety Requirements for Employee Workspaces.
1.04 REFERENCE STANDARDS

A. Electric equipment, materials and installation shall comply with the National Electrical Code (NEC) including California amendments and with the latest edition of the following codes and standards:

1. National Electrical Safety Code (NESC)
2. Occupational Safety and Health Administration (OSHA)
3. National Fire Protection Association (NFPA)
4. National Electrical Manufacturers Association (NEMA)
6. American National Standards Institute (ANSI)
7. Insulated Cable Engineers Association (ICEA)
8. Instrument Society of America (ISA)
9. Factory Mutual (FM)
10. National Electrical Testing Association (NETA)
11. California Electrical Code (CEC)
13. Institute of Electrical and Electronics Engineers (IEEE)
14. California Building Code (CBC)
16. Electrical Testing Laboratories (ETL)

B. Underwriters Laboratories (UL) listing is required for all equipment and materials where such listing is offered by the Underwriters Laboratories.

1.05 SUBMITTALS

A. Submit the credentials of each electrical worker employed on the Work for review by the Engineer to prove that they are certified pursuant to Labor Code §§3099.2 et seq. and 8 California Code of Regulations §§290.0 et seq. Submit copies of most current Certification Card clearly showing the complete name, address and State Electrical Worker Certification Number of each electrical worker. Where Apprentices or Electrical Trainees are employed on the Work, submit proof that they are currently registered with the Division of Apprenticeship Standards, are enrolled in an Approved Curriculum of Classroom Instruction, and that they work under the direct supervision of a Certified Electrician who is responsible for supervising no more than one uncertified person. Submittals must be accepted by the Engineer in writing before any electrical worker may perform work.

B. Submit, in accordance with Section 01 32 19, shop drawings for equipment, materials and other items furnished under Division 16. Submit detailed and
complete product data, including manufacturer’s name, material, sizes, finish, catalog/item number, technical data, as applicable, and other specific data as specified in each Section.

C. As a minimum, all equipment specified in each Section of Division 16 shall be submitted at one time. As an example all lighting fixtures shall be submitted together, all motor control centers shall be submitted together, etc.

D. Mark submittals to clearly identify proposed equipment, including accessories, options, and features and to exclude parts not applicable to the Work.

E. All dimensions shall be field verified at the Site and coordinated with the work of all other trades as necessary.

F. Qualifications for System Integrator.

G. Where Underwriters Laboratories (UL) Listed, Recognized, or Classified equipment is proposed or required, submit evidence to the Engineer for review and acceptance.

H. Where required in the equipment specifications, submit signed and sealed structural calculations and detailed drawings from a Civil Engineer licensed in the State of California for equipment anchorage and mounting to the primary structure.

I. Operation and Maintenance Data

1. Submit operations and maintenance data for equipment furnished under this Division. The manuals shall be prepared specifically for this installation.

2. Manuals shall include the following additional items:
   
   a. A complete list of the equipment supplied, including serial numbers, ranges and pertinent data.

   b. A table listing of the minimum and maximum operating ranges, "as left" settings for all timing relays and alarm and trip setpoints.

   c. System schematic drawings "As-Built," illustrating all components and electric connections of the systems supplied.

   d. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
e. The operating instructions shall also incorporate a functional description of the entire system, with references to the systems schematic drawings and instructions.

1.06 DRAWINGS

A. Electrical Drawings are diagrammatic; exact locations of electrical products shall be determined or verified in the field. Locations of equipment, inserts, anchors, motors, panels, pull boxes, manholes, conduits, stub-ups, fittings, lighting fixtures, power and convenience outlets, exterior lighting units, and ground wells are approximate unless dimensioned; verify locations with the City prior to installation. Field verify locations and any dimensions scaled from drawings.

B. Circuit layouts are not intended to show the number of fittings or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting and other electrical systems shown.

C. Unless otherwise accepted by the Engineer, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed in walls, below floor slabs, or above ceilings as applicable. At location of connection to equipment or instrument, conduit may need to be installed in exposed condition.

D. It is the intent of these Specifications that the electrical systems shall be suitable in every way for the service required. All materials and all work that may be implied as being incidental to the work of this Section shall be furnished at no additional cost to the City.

1.07 SIZE OF EQUIPMENT

A. Investigate each space in the structure through which equipment must pass to reach its final location. Coordinate shipping splits with the manufacturer to permit safe handling and passage through restricted areas in the structure.

B. The equipment shall be kept upright at all times during storage and handling. When equipment must be tilted for passage through restricted areas, brace the equipment to ensure that the tilting does not impair the functional integrity of the equipment.

1.08 EQUIPMENT IDENTIFICATION

Identify equipment (disconnect switches, separately mounted motor starters, control stations, etc.) furnished under Division 16 with the name of the equipment it serves. Motor control centers, control panels, panelboards,
switchboards, switchgear, starters, junction or terminal boxes, transfer switches, etc, shall have nameplate designations as shown on the Drawings.
1.09 JOB CONDITIONS

A. Construction Power

1. Make all arrangements for necessary construction power.

2. When required, provide all equipment, materials and wiring in accordance with the applicable codes and regulations.

3. Upon completion of the Work, remove all temporary construction power equipment, material, and wiring from the Site.

B. Storage: During construction, provide adequate storage for all equipment and materials that will become part of the completed facility so that it is protected from weather, dust, water, and other environmental impacts, or damage from construction operations.

C. Environmental Conditions

1. Altitude: Provide materials and equipment suitable for installation and operation under rated conditions at no more than 3,300 feet above sea level.

2. Provide equipment and devices installed outdoors in direct sun or shade, in unconditioned buildings, or in unventilated cabinets capable of continuous operation within an ambient temperature range of 20ºF to 122ºF.

3. Classification of Areas: Use equipment, materials, and wiring methods rated and suitable for the types of locations in which they are located, as defined below.

   a. Dry Locations: All those indoor areas which do not fall within the definition below for Wet, Damp, or Corrosive Locations and which are not otherwise designated on the Drawings. Use minimum NEMA 250, Type 1, Type 3, or Type 12 enclosures.

   b. Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Drawings. Use minimum NEMA 250, Type 3R or Type 4 enclosures.
c. Damp Locations: All spaces wholly or partially underground, or having a wall or ceiling forming part of a channel or tank, unless otherwise designated on the Drawings. Use minimum NEMA 250, Type 4X-316 stainless steel enclosures.

d. Corrosive Locations: Areas where chemicals are stored or processed. Use NEMA 250, Type 4X-316 stainless steel or non-metallic enclosures.

1.10 SYSTEMS INTEGRATION

A. The Contractor shall be responsible for ensuring compatibility and providing integrations of all individual components and systems that are to be interconnected throughout the facility.

B. Contractor shall provide system integration drawings. Integration shall include all pertinent electrical, communication, controls, and instrumentation components as applicable, as shown on the Drawings, and as included in other Sections of the Specifications. The systems shall include, but are not limited to the following:

1. 480VAC Power Supply and Distribution
2. 208/120VAC and 120/240VAC power supply and distribution
3. 480VAC Motors and Pumps
4. Transformers
5. Instruments
6. Connections between existing and new field devices/equipment to the site PLC

C. The Contractor shall provide a System Integrator. The System Integrator shall be a competent and experienced individual, team of individuals, or a firm capable of understanding all electrical, communication, instrumentation, and controls systems and their components and their required connections, interconnections, functionalities, and integrations. The Contractor’s System Integrator shall be responsible for the following at a minimum:

1. Ensure that shop drawings meet the requirements of the specified system and its functionality.

2. Ensure that interconnecting equipment and components for multiple systems are compatible with each other.

3. Develop detailed and complete connections and interconnecting diagrams for approved electrical equipment, components, and systems.
4. Develop detailed and complete connections and interconnecting diagrams for communication components and systems.

5. Review shop drawings of equipment to be furnished under other related Divisions and prepare coordinated wiring interconnection diagrams.

6. Submit all approved diagrams in AutoCAD format, version 2007 or later.

7. Ensure that all record drawings are complete, properly detailed, and organized.

1.11 COORDINATION WITH SCE

A. Coordinate with SCE as required to complete electrical work.

B. The Contractor shall submit shop drawings, diagrams, and test reports to SCE for review and approval in accordance with the requirements specified in other Sections.

C. The Contractor shall notify the City and Southern California Edison, in writing, at least 40 Calendar Days in advance of requiring the services of Southern California Edison.

D. The Contractor shall coordinate with SCE for components to be installed by SCE. These include the following, but are not limited to:
   1. New SCE transformer.
   2. New cables from SCE point of connection to the new transformer and from the transformer to SCE pull section in the switchgear.

E. The Contractor shall coordinate with SCE for scheduling inspection by SCE representatives of all work that would affect SCE system and as required by SCE. This includes, but is not limited to:
   1. Installation of new service conduits from SCE point of connection to new transformer.
   2. Installation of SCE service conduit from the new transformer to SCE pull section in the switchgear.
   3. Pull boxes.
   4. Transformer slab, pad, and associated components.

F. All work that would affect SCE system shall be approved in writing by SCE. The Contractor shall coordinate with SCE for obtaining such approval from SCE.
G. The Contractor shall coordinate with SCE for energizing and de-energizing the SCE permanent power system as required.

H. The Contractor shall coordinate with SCE for energizing and de-energizing the SCE temporary power system as required.

I. No Extra Work or Time will be granted to the Contractor for not coordinating with SCE in a timely manner for their required services and approval of shop drawings.

1.12 COORDINATION WITH FRONTIER

A. Coordinate with Frontier as required to complete communication work.

B. The Contractor shall notify the City and Frontier, in writing, at least 40 Calendar Days in advance of requiring the services of Frontier.

C. The Contractor shall coordinate with Frontier for components to be installed by Frontier. These include the following, but are not limited to:

1. Fiber optic cables.
2. Termination of cables and associated equipment inside the Frontier Termination Cabinet.

D. The Contractor shall coordinate with Frontier for scheduling inspection by Frontier representatives of all work that would affect Frontier system and as required by Frontier. This includes, but is not limited to:

1. Installation of new conduit to pump station building.
2. Installation of Frontier termination box/cabinet.
3. Connection between Frontier equipment and site equipment.

E. The Contractor shall coordinate with Frontier for activating the communication system as required.

F. No Extra Work or Time will be granted to the Contractor for not coordinating with Frontier in a timely manner for their required services and approval of shop drawings.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS
A. Materials and equipment shall be new, except where specifically identified on the Drawings to be re-used.

B. Where two or more units of the same class of material or equipment are required, products shall be of a single manufacturer. Component parts of materials or equipment need not be products of the same manufacturer, unless otherwise specified.

C. It is the intent of these Specifications and Drawings to secure high quality in all materials and equipment in order to facilitate operation and maintenance of the facility. All equipment and materials shall be new and the products of reputable suppliers having adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product. All equipment shall be designed for the service intended and shall be of rugged construction, designed and constructed to withstand all stresses that may occur during fabrication, transportation, erection, and continuous or intermittent operation.

D. All equipment shall be adequately stayed, braced, and anchored and shall be installed in a neat and workmanlike manner. All equipment designed to be fixed in position shall be securely fastened in place. For all equipment with (1) an operating weight of 400 pounds or more or (2) specifically identified in the Specifications for anchorage calculations, detailed engineering anchorage calculations and figures shall be submitted to the Engineer. For equipment weighing less than 400 pounds, the equipment manufacturer shall provide recommended anchorage information to the Contractor for use in the installation of the equipment.

E. Lifting lugs or lifting eyebolts shall be provided for all equipment or any component weighing 50 pounds or more for setting of units or future removal. They shall be galvanized or zinc plated steel.

F. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, and shall be of sturdy and durable construction suitable for long, trouble-free service. Light-duty “standard” quality devices shall not be used.

G. Provide materials and equipment listed by UL wherever standards have been established by that agency. Where UL testing or evaluation of the individual components has occurred, UL Listed (generally tested) or UL Recognized (tested for particular applications) labels or badges shall be affixed to the components and must remain clearly visible after installation.

H. Provide materials and equipment with manufacturer’s standard finished system and manufacturers’ standard finish color, except where specific color is shown.
If manufacturer has no standard finish system, equipment shall be finished in accordance with the requirements of Sections 09 91 00 and 09 92 00.

2.02 ENCLOSURE TYPES

Unless otherwise required, electrical enclosures shall be NEMA Types. Rating shall be in accordance with Paragraph "Job Condition".
2.03 SUBSTITUTION OF EQUIPMENT

A. The electrical drawings may have been prepared based on the equipment manufactured by a specific company. Unless otherwise specified, the Contractor may provide equal equipment from different manufacturer.

B. Changes from the layout shown to facilitate use of that equipment shall not be a basis for additional payment; neither shall changes in electrical controls or wiring or piping caused by the use of equal equipment be a basis for additional payment.

C. Equipment control schematics shown on the Drawings are schematic and based on equipment from a specific manufacturer, and they may differ from the accepted equipment. The Contractor shall generate control diagrams, including terminal and wire numbers, as required for the accepted equipment and record on the shop drawings and Record Drawings at no additional cost to the City.

D. Redesign of electrical or mechanical work, which is required due to the Contractor's use of an alternate item, arrangement of equipment and/or layout other than specified in the Contract Documents, shall be done by the Contractor at his own expense. Redesign and detailed plans shall be submitted to the Engineer for acceptance. No additional compensation will be provided for changes in the Work, either his own or others, caused by such redesign.

PART 3 - EXECUTION

3.01 GENERAL

A. Electrical Drawings show general location of equipment, devices, and raceway, unless specifically dimensioned.

B. Unless otherwise accepted by the City, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed in walls, below floor slabs, or above ceilings, as applicable.

C. Where circuits are shown as "home-runs," all necessary fittings and boxes shall be provided for a complete raceway installation, whether shown on the Drawings or not. Where home-runs indicate conduit is to be installed concealed or exposed, the entire branch circuit shall be installed in the same manner. Unless otherwise indicated, install branch circuit conduits exposed in process/industrial type spaces and concealed in finished spaces.
D. Install work in accordance with NECA Standard of Installation Practices, unless otherwise specified.
E. Install each 3 phase circuit in a separate conduit unless otherwise shown on the Drawings.

F. Verify the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.

G. Conduit routes shall be adjusted as required to match locations of approved equipment or instrument.

H. Load Balance

1. Drawings and Specifications indicate circuiting to electrical loads and distribution equipment.

2. Balance electrical load between phases as closely as possible on switchboards, panel boards, motor control centers, and other equipment where balancing is required.

3. When loads must be reconnected to different circuits to balance phase loads, maintain accurate record of changes made, and submit to the Engineer a machine-printed circuit directory that lists final circuit arrangement.

I. Provide a quality of workmanship for all installations that is consistent with the highest standards of industry excellence using only qualified personnel who are craftsmen within their trade(s). Personnel shall have personal knowledge and skill with all products of their portion of the construction, and have experience on projects of similar scope and magnitude.

3.02 INSTALLING AND PROTECTING EQUIPMENT

A. Electrical equipment, instruments, and similar manufactured items shall be installed in accordance with manufacturer’s written instructions and recommendations and in accordance with the requirements of the Contract Documents.

B. Install all floor-mounted equipment on 3-inch-high reinforced concrete pads, unless otherwise specified or shown on the Drawings.

C. All electrical equipment shall be provided with disconnecting means as required by NEC Article 400, whether or not they are shown on the Drawings, at no additional cost to the City.
D. Exact locations are required for stubbing-up and terminating concealed conduit. Obtain shop drawings and templates from equipment vendors or other subcontractors and locate the concealed conduit before the slab is placed.

E. The Contractor shall design, fabricate and install structural support members and anchors for all equipment for all applicable forces, including seismic forces.

F. Electrical equipment shall be protected and maintained against mechanical, rodent, and water damage throughout the Work. Store electrical equipment in dry permanent shelters. Do not install electrical equipment in place until structures are weather-tight.

G. Exercise care at all times after installation of all equipment to keep any foreign matter, dust, dirt, debris, or moisture away from equipment that will be powered. Use protective sheet metal covers, canvas sheeting, heat lamps, etc., as needed to ensure equipment protection.

H. Thoroughly clean all soiled surfaces of installed equipment and materials to factory-new condition following construction. Clean out and vacuum all construction debris from the interiors of all equipment enclosures.

I. Repaint any damage to factory applied paint finish using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted in accordance with the field painting requirements specified in Section 09 92 00 at the Contractor's expense.

3.03 SLEEVES AND FORMS FOR OPENINGS

A. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. Locate all necessary slots for electrical work and form before concrete is poured.

B. Exact locations are required for stubbing-up and terminating concealed conduit. Obtain shop drawings and templates from equipment vendors or other subcontractors and locate the concealed conduit before the floor slab is poured.

C. Where setting drawings are not available in time to avoid delay in scheduled floor slab pours, the Engineer may allow the installations of such conduit to be exposed. Requests for this deviation must be submitted in writing. No additional compensation for such change will be allowed.

D. Seal all openings, sleeves, penetration and slots as specified in other Section of Division 16.

3.04 CUTTING, DRILLING, WELDING, AND PATCHING
A. Provide any cutting, drilling, welding, and patching that is required for the completion of electrical work, except as noted herein.

B. Do not cut joists, beams, girders, columns or any other structural members, unless accepted by the Engineer in writing.

C. Core drill holes in concrete floors and concrete or masonry walls as required. Rotary hammer drill holes will not be acceptable. Locate existing reinforcement prior to drilling holes. Locate core holes to avoid cutting of existing reinforcement.

D. Cutting and patching shall be done in a thoroughly workmanlike manner and comply with modifications and repair to concrete as specified in Division 3. Sawcut concrete and masonry prior to breaking out sections.

E. Unless otherwise approved in writing by the Engineer, existing reinforcements shall not be cut.

F. Cut opening only large enough to allow easy installation of the conduit.

G. Fill all voids between conduit and wall using epoxy, epoxy mortar, or cementitious mortar as approved by the Engineer.

H. When existing conduits are cut at the floor line of wall line, they shall be filled with grout of suitable patching material. If conduits are steel, coat cut ends with epoxy paint or grind below floor line and completely cover with grout.

I. Remove rubble and excess patching materials from the Site.

### 3.05 EXCAVATION AND BACKFILL

Refer to Division 2 and Drawings for excavation, backfilling, and site restoration work.

### 3.06 CONCRETE AND SLURRY

A. Where specified or shown on the Drawings, provide the required concrete installations for conduit encasement and equipment foundations.

B. Where specified or shown on the Drawings, provide the required cement-sand slurry installation for conduits.

C. Refer to Section 03 30 00 for all concrete work and 02 25 00 for slurry.
3.07 WARNING SIGNS

A. Install markings, identifications, warning, caution, or instruction signs where required by NEC, NFPA 70E, and NFPA 79 paragraph 4.5.1, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect.

B. The design of safety signs and labels shall conform to ANSI Z535.4. Panelboards and motor controllers shall be field marked to warn qualified persons of potential electric arc hazards. The marking shall be located so as to be clearly visible to a qualified person before examination, adjustment, servicing, or maintenance of the equipment, in conformance with NEC Article 110.

C. Install engraved plastic-laminated instruction signs with approved legend where instruction or explanations are needed for system or equipment operation.

D. Install approved preprinted cellulose acetate metal-backed butyrate warning and caution signs that are weather-resistant, non-fading, and have 20-gage, galvanized steel backing. Provide with ¼-inch grommets in corners for mounting.

3.08 MANUFACTURER’S SERVICE

A. Manufacturer’s installation and commissioning representatives specifically trained in the installation of the equipment shall be furnished to supervise the installation and make adjustments, repairs, corrections, and perform fine-tuning, startup, testing, training, and final adjustment tasks of the equipment furnished. This shall include the final adjustments as required for all programmable features and calibration of instruments and meters.

B. Additional field services shall be provided as specified in individual sections and Sections 01 64 00 and 01 75 00.

3.09 FIELD TESTING

A. Field testing shall be performed in the presence of the City. The Contractor shall provide written notice to the City at least 5 Working Days in advance of the scheduled test.

B. Field testing procedures shall duplicate as nearly as possible the conditions of operation and shall be selected to demonstrate that the equipment is operational and free from damage. Each control device, item, or mechanical,
electrical instrumentation equipment, and control circuits shall be considered in
the testing procedures to demonstrate that the equipment has been properly
serviced, aligned, connected, calibrated, and adjusted prior to operation.

3.10 CLEANUP

Upon completion of the electrical work, remove all surplus materials, rubbish,
and debris accumulated during the construction work. Leave the entire area
neat, clean, and acceptable to the City.

END OF SECTION
SECTION 16 11 00
RACEWAYS, BOXES, FITTINGS AND SUPPORTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install complete raceway systems as specified in the Contract Documents and as required to complete the work.

B. Conduit and wire schedules (included on the Drawings) are prepared as a guide to the Contractor; however, omissions in the schedule shall not relieve the Contractor of the responsibility of furnishing and installing conduits and wire as required by the remainder of the Contract Documents.

C. Only major conduit runs are shown. Miscellaneous small equipment control conduits, final flexible conduit connections, conduits on skid-mounted systems, etc. are not detailed but shall be provided as required for a fully functional system.

1.02 RELATED WORK

A. Trenching and surface restoration shall be as specified in Division 2 and as shown on Drawings.

B. Concrete Work is included in Section 03 30 00.

C. Electrical General Provisions are included in Section 16 00 00.

D. Wires and Cables (600 Volt Maximum) are included in Section 16 12 00.

E. Miscellaneous Electrical Material and Equipment are included in Section 16 19 10.

F. Electrical System Testing is included in Section 16 96 00.

G. Conduit and wire schedules are shown on the Drawings.

1.03 SUBMITTALS

A. All submittals shall be in accordance with Sections 01 32 19 and 16 00 00.
B. Submit product data, including manufacturer’s name, material, sizes, finish, catalog/item number, and technical data, as applicable for all items to be furnished under this Section.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Rigid Steel Conduit

Rigid steel conduits shall be full weight, galvanized or sherardized, with a lacquer or varnish coating on the inside surfaces as manufactured by the Allied Tube and Conduit Corp.; Wheatland Tube Co.; Triangle PWC Inc.; or approved equal.

B. Electrical Metallic Tubing (EMT)

Electrical metallic tubing (EMT) shall be manufactured from mild steel tube with continuous welded seams. EMT shall be galvanized and coated with lubricating coating on interior surfaces. EMT shall be as manufactured by the Allied Tube and Conduit Corp.; Wheatland Tube Co.; Triangle PWC Inc.; or approved equal.

C. PVC Coated Rigid Steel Conduit

PVC coated rigid steel conduit shall have a minimum 40 mil thick, polyvinyl chloride coating permanently bonded to hot-dipped galvanized steel conduit and an internal chemically cured urethane or enamel coating. The ends of all couplings, fittings, etc., shall have a minimum of one pipe diameter in length of PVC overlap. PVC conduit and fittings shall be manufactured by Occidental Coating Company; “Plasti-Bond Red” as manufactured by Robroy Industries; Triangle PWC Inc.; or approved equal.

D. Rigid Nonmetallic Conduit

Rigid nonmetallic conduit shall be rigid PVC Schedule 80 as manufactured by Carlon Inc.; Kraloy Products Co., Inc.; Highland Plastics Inc.; or approved equal.

E. Liquid Tight Flexible Metal Conduit, Couplings and Fittings

1. Liquid tight flexible metal conduit shall be Sealtite, Type UA, manufactured by the Anaconda Metal Hose Div.; Anaconda American Brass Co.; American Flexible Conduit Co., Inc.; Universal Metal Hose Co.; or approved equal.
2. Fittings used with liquid tight flexible metal conduit shall be of the screw-in type insulated PVC coated liquid tight as manufactured by the Thomas & Betts Co.; Crouse-Hinds Co.; or approved equal. Fittings used on length of liquid tight flexible metal conduits greater than 2 feet shall be strain relief flexible metallic conduit grips Type 74093513 Hubbell/Kellems, T&B WMG-LT3 grips on Type 5800 T&B connectors, or approved equal.

F. Flexible Metallic Tubing

1. Flexible metallic tubing shall be for use under the provisions of NEC Article 349.

2. Flexible metallic tubing shall be hot-dipped galvanized steel strips shaped into interlocking convolutions firmly joined to one another assuring a complete lock similar to Tristeel as manufactured by Triangle PWC, Inc. or approved equal.

3. Flexible metallic tubing shall be used only indoors for connection to lighting fixtures in areas classified as NEMA 1.

4. Furnish and install insulated bushings at terminations for conductor protection.

G. Conduit Marking

Each 10-foot section of conduit delivered to the Site shall bear the Underwriters’ Laboratories, Inc. label of approval.

H. Flexible Couplings

Flexible couplings shall be “Jake Type” as manufactured by the Crouse-Hinds Co.; Appleton Electric Co.; Killark Electric Manufacturing Co.; or approved equal.

I. Boxes and Fittings

1. Pressed steel switch and outlet boxes shall be hot-dipped galvanized provided with appropriate plaster or tile ring as manufactured by the Raco Manufacturing Co.; Adalet Co.; O.Z. Manufacturing Co.; or approved equal.

2. For use in NEMA 1 areas, terminal boxes, junction boxes, pull boxes etc., shall be sheet steel unless otherwise shown on the Drawings. Boxes shall be galvanized and have continuously welded seams. Welds shall be ground smooth and galvanized. Box bodies shall be flanged and shall not have holes or knockouts. Covers shall be gasketed and fastened with
stainless steel screws. Terminal boxes shall be furnished with hinged
doors, terminal mounting straps and brackets. Boxes shall be as 
manufactured by Hoffman Engineering Co.; Lee Products Co.; 
Keystone/Rees, Inc.; or approved equal.

3. NEMA 3R and 4 terminal boxes, junction boxes, pull boxes, etc. shall be 
made from stainless steel sheet. Boxes shall have continuously welded 
seams and mounting feet. Welds shall be ground smooth. Boxes shall be 
flanged and shall not have holes or knockouts. Covers shall be gasketed 
and fastened with stainless steel clamps. Terminal boxes shall be 
furnished with hinged doors, terminal mounting straps and brackets. Boxes 
shall be as manufactured by Hoffman Engineering Co.; Lee Products Co.; 
ASCO Electrical Products Co., Inc.; or approved equal.

4. Cast or malleable iron device boxes shall be Type FD. All cast or malleable 
iron boxes and fittings with required conduit hubs shall have cadmium-zinc 
finish with cast covers and stainless steel screws as manufactured by the 
Crouse-Hinds Co. or approved equal. Where installed on PVC coated 
conduit systems, all cast boxes shall be PVC coated (Kor Kap Plasti-bond, etc.) as manufactured by Rob Roy or approved equivalent.

5. Steel elbows and couplings shall be hot-dipped galvanized. Elbows and 
couplings used with PVC coated conduit shall be furnished with a PVC 
coating bonded to the steel, the same thickness as used on the coated 
steel conduit.

6. Myers hubs shall be used for termination of the metal rigid conduits in the 
sheet metal pull boxes, cabinets, and instruments that do not have integral 
threaded hubs. Where conduits are required to be PVC coated, all fittings 
and straps shall also be PVC coated.

7. Combination expansion-deflection fittings embedded in concrete shall be 
Type XD as manufactured by the Crouse-Hinds Co.; O.Z./Gedney Co.; 
Spring City Electrical Mfg. Co.; or approved equal.

8. Combination expansion-deflection fittings installed exposed shall be Type 
XJ as manufactured by Crouse-Hinds Co.; O.Z. Gedney Co.; Spring City 
Electrical Manufacturing Co.; or approved equal.

9. Conduit sealing bushings shall be O.Z./Gedney Type CSB or approved 
equal.

10. All fixture junction and device boxes and fittings used with PVC-coated 
conduit shall be constructed of ferrous material and furnished with a factory-
applied PVC coating bonded to the metal, the same thickness as used on 
the coated steel conduit. The ends of couplings and fittings shall have a
minimum of one pipe diameter PVC overlap to cover threads and provide a seal.

11. Conduit drains. Install conduit drains for boxes, fittings and enclosures. The drains shall be Crouse-Hinds Type CO or approved equivalent.

J. Conduit Mounting Equipment

1. In NEMA 1 areas, hangers, rods, backplates, beam clamps, channel, etc. shall be galvanized iron or steel. Such products shall be Unistrut, Power-Strut, Grinnell, or approved equal.

2. Stainless steel channel with stainless steel hardware shall be used in areas designated NEMA 3R or 4 on the Drawings and in outdoor locations.

K. Conduit Seals

1. Conduit wall seals for new concrete walls below grade shall be O.Z./Gedney Co. type WSK; Spring City Electrical Manufacturing Co. type WDP; or approved equal.

2. Conduit wall seals for cored holes shall be type CSML as manufactured by the O.Z./Gedney Co. or approved equal.

3. Conduit wall and floor seals for sleeved openings shall be CSMI as manufactured by O.Z./Gedney Co. or approved equal.

L. Conduit Identification Plates

1. Conduit identification plates shall be stamped brass or stainless steel discs, minimum 40 mils thick x 1 1/2-inch diameter, affixed to conduits with stainless steel tie-wires or chain.

2. Conduit identification plates shall be installed at each terminus of the conduit and at least once in every accessible area through which they pass.

3. Identification plates shall be as manufactured by the Panduit Corp. or approved equal.

M. Wall and Floor Slab Opening Seals

Wall and floor slab openings shall be sealed with "FLAME-SAFE" as manufactured by the Thomas & Betts Corp.; Pro Set Systems; Neer Mfg. Co.; Specified Technologies, Inc.; or approved equal.
PART 3 - EXECUTION

3.01 RACEWAY APPLICATIONS

A. All exposed conduits in the dry indoor locations shall be rigid steel or EMT. The conduits in the dry indoor locations shall be hot-dip galvanized.

B. The conduits in the wet indoor locations, vaults, and exposed outdoors shall be PVC coated rigid steel with internal enamel coating. Use of intermediate steel conduit (IMC) is prohibited.

C. Short lengths (less than 3 feet) of liquid tight flexible metal conduit shall be used to terminate at rotating or vibrating equipment or for final termination to instruments and analyzers.

D. Schedule 80 PVC conduit shall be used when routed underground, below slab-on grade. Conduit penetrations or stubouts from vaults and underground structures or concrete slabs on grade shall be made with PVC coated rigid conduit extending a minimum of 3” above or 12” beyond the concrete wall or slab. Conduits entering vaults and underground structures shall employ specified conduit sealing fittings. Conduits penetrating concrete walls above grade shall employ specified conduit sealing fittings. Where terminated into bottoms of floor standing control panels or enclosures, conduits shall be provided with insulated throat grounding bushings.

E. All conduit of a given type shall be the product of one manufacturer.

3.02 BOX APPLICATIONS

A. Exposed switch, receptacle and lighting outlet boxes and conduit fittings shall be Type “FD”, galvanized cast or malleable iron with threaded hubs. Where installed in PVC-coated conduit runs, all such boxes and fittings shall be PVC coated.

B. Concealed and in dry indoor locations installed switch, receptacle and lighting outlet boxes shall be pressed/stamped steel.

C. Terminal boxes, junction boxes and pull boxes shall have NEMA ratings suitable for the location in which they are installed.

3.03 FITTINGS APPLICATIONS

A. Combination expansion-deflection fittings shall be used where conduits cross structure expansion joints. Provide bonding jumpers around fittings.
B. Conduit wall seals shall be used where conduits penetrate walls or at other locations shown on the Drawings.

C. Conduit sealing bushings shall be used to seal conduit ends exposed to the weather, where conduits cross boundaries between different NEMA ratings, in vaults, and at other locations shown on the Drawings.

3.04 INSTALLATION

A. All conduits shall be kept dry and free from debris during construction by the use of pipe plugs or caps. Duct tape or thermoplastic tape is not acceptable for such protection during the course of construction. PVC conduit shall be stored away from sources of UV light and out of direct sunlight.

B. Conduits smaller than 3/4-inch electrical trade size shall not be used. A 1/2-inch flexible conduit 3’ or shorter in length will be acceptable at final termination to instruments with threaded connection hubs.

C. Conduits shall be continuous with no more than 270-degree bends and shall not exceed more than 350 feet in length. Where the run exceeds more than 350 feet between pull boxes, pull boxes shall be installed in such a way that no section containing one or more bends exceeds 350 feet. Pull boxes shall be provided as required and as shown on the Drawings.

D. Conduits shall be installed underground except where necessary to run exposed for connection to equipment and as indicated on the Drawings. Conduits shall not be embedded within concrete slabs or walls unless specifically noted otherwise on the Drawings. Install conduits under slabs.

E. Unless otherwise shown, underground conduit shall be buried with a minimum of 30 inches of cover. Conduit trench and trench materials shall be as shown on the Drawings.

F. Plug or cap spare raceways and seal them watertight at all manholes, buildings, and structures using approved caps or plugs.

G. Install pulling-in irons opposite all raceway entrance manholes.

H. Exposed conduits shall be installed with runs parallel to or perpendicular to main axis of equipment, with right angle turns consisting of symmetrical bends or cast metal fittings. Bends and offsets shall be avoided where possible, but where necessary shall be made using approved conduit bending machine. All conduits on exposed work, including conduits run within partitions and above suspended ceilings, shall be run at right angles to and parallel with the surrounding wall and shall conform to the form of the ceiling. No diagonal runs
will be allowed. Bends in parallel conduit runs shall be concentric. All conduits shall be run straight and true.

I. All conduits terminating at wiring gutter, panelboard or other sheet metal enclosures shall be provided with insulated ground bushings. Connections to the motor and control devices shall be made with short lengths of liquid tight flexible metallic conduit fitted with watertight connectors. Conduits terminating at penetrations to control cabinets or sheet metal enclosures around instruments or analyzers shall be made with Myers grounding hubs. O-ring style sealing locknuts are not acceptable.

J. A minimum of 12 inches of separation shall be provided between primary power and communication conduit. Power and control conduits shall only cross each other at 90° angles.

K. Provide continuous, non-spliced ¼" polypropylene pull rope each spare conduit and where indicated. Provide at least 3 feet of extra rope at each end.

L. Conduit supports, other than for underground ductbanks, shall be spaced at intervals of 8 feet or less, as required to obtain rigid construction and as required by the NEC. Duct banks that are to be encased or semi-encased shall be staked to prevent floating of the duct while pouring concrete. Conduit banks installed underground shall be fabricated with the use of plastic snap-together spacers or “chairs”. Maintain 2” clear space between conduits and between conduits and side/bottom of trench.

M. Single conduits shall be supported by means of one-hole pipe clamps in combination with one-screw back plates to raise conduits from the surface. Multiple runs of conduits shall be supported on conduit mounting channel, or “strut.” Mount “strut” on trapeze type hangers with steel horizontal members and threaded hanger rods. The rods shall be not less than 3/8-inch diameter. Surface mounted panel boxes, junction boxes, conduit, etc. shall be supported by spacers to provide a minimum of 1/2-inch clearance between wall and equipment.

N. Conduit supports shall be attached to structural members only. Conduit supports shall be attached to structural steel by means of beam or channel clamps. They shall be fastened by wood screws on wood, toggle bolts on hollow masonry units, concrete anchors on concrete or brick, and machine screws, welded-thread studs or by means of beam or channel clamps on steelwork.

O. Seal all conduits entering all control cabinets, field instruments and steel plates following installation with approved sealing material.
P. All conduits, which may under any circumstance contain liquids, such as water, condensation, liquid chemicals, etc., shall be arranged to drain away from the equipment served. Seal all conduits entering control and instrumentation enclosures.

Q. Provide conduit drains in conduits subject to condensation or water incursion. Where conduit installation results in a conduit low point likely to collect condensation, provide approved conduit drain fittings.

R. Conduit terminating in stamped steel boxes shall have double locknuts and insulated plastic bushings or ground bushings.

S. Conduit terminating in NEMA 3R and 4 enclosures shall be terminated with Myers type grounding conduit hubs. O-ring style sealing locknuts are not acceptable.

T. Conduits containing equipment grounding conductors and terminating in sheet steel boxes shall have insulated throat grounding bushings.

U. Liquid tight flexible metal conduit shall be used for all motor terminations, the primary and secondary windings of transformers, generator terminations at field instruments, and other equipment where vibration is present or at equipment requiring frequent movement for adjustment. Maximum length of liquid tight flexible metal conduit shall be 36 inches.

V. Conduit ends exposed to the weather shall be sealed with conduit sealing bushings.

W. PVC conduit shall be supported with non-metallic clamps, non-metallic racks and stainless steel hardware; galvanized rigid steel conduit shall be supported with galvanized steel clamps, racks, and hardware; and PVC coated galvanized rigid steel conduit shall be supported with PVC coated steel or non-metallic racks and stainless steel hardware.

X. PVC boxes, conduit fittings, etc. with integral hubs (where permitted) shall be solvent-welded directly to the PVC conduit system.

Y. Non-metallic boxes with field drilled or punched holes shall be connected to the PVC conduit system with threaded and gasketed PVC Terminal Adapters affixed with grounding bushings.

Z. Expansion fittings shall be used on exposed runs of PVC conduit where required for thermal expansion or where crossing construction joints in concrete encased applications. Installation and number of fittings shall be as recommended by manufacturer.
AA. All conduits entering or leaving a switchboard or other multiple compartment enclosure shall be stubbed into the bottom or top horizontal wireway or other manufacturer-designated area, directly below or above the vertical section in which the conductors are to be terminated. All conduits stubbed into floor-mounted enclosures shall be steel and shall be provided with termination bushings. Metallic conduits shall use termination bushings with integral grounding rings.

BB. A conduit identification plate shall be installed on all power, instrumentation and control conduits at each end of the run and at intermediate junction boxes, hand holes, etc. Conduit plates shall be installed before conductors are pulled into conduits. Exact identification plate location shall be coordinated with the City at the time of installation to provide uniformity of placement and ease of reading. Conduit numbers shall be exactly as shown on the Drawings. Conduits noted as spare shall be capped or plugged at both ends with watertight removable fittings. If new conduits are added during construction, they shall be marked accordingly and shall be added to the conduit schedule on Record Drawings.

CC. Where no type or size is indicated for junction boxes, pull boxes or terminal cabinets, they shall be sized in accordance with the requirements of NEC Article 370.

DD. Provide steel channels, flat iron and channel iron for the support of all electrical equipment and devices. Provide all anchors, inserts, bolts, nuts, washers, etc. for a rigid installation. Treat cut ends of all support devices with galvanizing cold zinc-rich paint.

EE. Conduits shall not cross pipe shafts, access hatches or vent duct openings and shall not obstruct across ladders in vaults. They shall be routed to avoid such present or future openings in floor or ceiling construction.

FF. The use of running thread conduits is prohibited.

GG. Provide conduit wall seals around all conduits penetrating walls below grade or other locations shown on the Drawings or where required to prevent groundwater leakage through the conduit penetration and into the structure.

HH. Penetration of slabs on grade shall be done with PVC coated rigid steel conduit.

II. Conduit runs under floor slabs, walls, etc. shall stub up as close as possible to the served equipment avoiding any equipment mounting pads or stands. Conduit stub-ups through slabs shall be at 90° to the slab in every axis and shall be PVC coated rigid steel.
JJ. All conduits cut to length in the field shall be reamed to remove all burrs prior to installation. All threads cut onto Ocal-coated GRC shall be painted with an approved enamel, and all damage to the PVC coating shall be patched with a manufacturer-approved PVC patch material applied in the same thickness as the undamaged surrounding area. Excessively damaged PVC coating shall be cause for rejection of the conduit to the nearest coupling or fitting.

KK. All enclosure and fitting screws shall be treated with anti-seize compound when installed.

LL. All conduits over 1” trade size shall be proved with Contractor’s supplied mandrel not more than 1/4” smaller than the inside diameter of the conduit. The mandrel test shall be witnessed by the City.

MM. Where conduits pass through openings in walls, ceilings, or floor, the openings shall be sealed against the passage of flame and smoke with sealing systems of equal fire rating to the wall, ceiling, or floor.

NN. Outlet and junction boxes shall be installed in the locations shown on the Drawings, or where required, in a rigid and satisfactory manner by wood screws on wood, expansion screws on masonry or concrete, or machine screws on steel work. The arrangement of the threaded openings shall be as indicated on the Drawings or as required to make a neat conduit arrangement.

OO. No wire shall be pulled until the conduit system is complete in all details and in the case of exposed work, not until the conduit system has been completed in every detail.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install and test all wire, cable and appurtenances as specified in the Contract Documents and as required to complete the work.

B. Conduits and wires specified in the Contract Documents are prepared as a guide to the Contractor; however, omissions shall not relieve the Contractor of the responsibility of furnishing and installing conduits and wires as required interconnecting the equipment furnished under this Contract.

C. The conduit and wire schedules are based on the equipment characteristics as described in these Specifications. The exact size and wire fill shall be coordinated with the final equipment supplied by the Contractor. If changes are required to the size of wires or conduits or to the number of wires due to Contractor-initiated modifications, such changes shall be provided at no extra cost to the City.

D. Only major conduit runs are shown. Miscellaneous small equipment control conduits, final flexible conduit connections, conduits on skid-mounted systems, etc. are not detailed but shall be provided as required for a fully functional system.

1.02 RELATED WORK

A. Electrical General Provisions are included in Section 16 00 00.

B. Raceways, Boxes, Fittings, and Supports are included in Section 16 11 00.

C. Miscellaneous Electrical Material and Equipment are included in Section 16 19 10.

D. Electrical System Testing is included in Section 16 96 00.

E. Conduit and wire schedules are shown on the Drawings.

1.03 SUBMITTALS
A. Submittals shall be in accordance with Section Sections 01 32 19 and 16 00 00.

B. Submit catalog data indicating manufacturer, insulation designation, and ratings for:
   1. Power, control, and instrumentation wires.
   2. Termination and splicing materials.
   3. Circuit identification system.

C. Submit results of wire field testing per Paragraph 3.05.

1.04 DELIVERY, STORAGE AND HANDLING

Carefully handle all conductors to avoid kinks and damage to insulation.

PART 2 - PRODUCTS

2.01 GENERAL

A. Service and branch circuit conductors shall be of annealed, stranded 98 percent conductivity soft drawn copper of the sizes indicated on the Drawings, or as required for compliance with required codes and regulations.

B. Except for control, signal and instrumentation circuits, wire smaller than No. 12 AWG shall not be used.

C. All conductors shall be stranded, except that lighting and receptacle wiring may be solid.

2.02 BUILDING WIRE

A. Wire for lighting, receptacles and other circuits not exceeding 150 volts to ground shall be NEC type THHN/THWN as manufactured by the Okonite Co.; Carol Cable Co. Inc.; Pirelli Cable Corp. or equal.

B. Wire for circuits over 150 volts to ground shall be NEC type THHN/THWN for sizes 1/0 AWG and smaller and shall be NEC type XHHW for sizes 2/0 AWG and larger as manufactured by the Okonite Co.; Carol Cable Co. Inc.; Pirelli Cable Corp. or equal.

C. All conductors size No. 1 AWG and smaller shall be 75 degree C, 600 volt, moisture resistant, Type THWN or noncarbon filled, chemically cross-linked.
polyethylene type XHHW and conductors 1/0 AWG and larger shall be 75
degree C, 600 volt, moisture resistant noncarbon filled, chemically cross-linked
polyethylene type XHHW.

D. All conductors shall bear the Underwriters’ Laboratories, Inc. label of approval.
Conductors shall be continuous, with no splices between points of termination.

2.03 CONTROL WIRE

A. Wire shall be No.14 AWG NEC type THHN/THWN, stranded as manufactured
by the Okonite Co.; Carol Cable Co. Inc.; Pirelli Cable Corp. or approved equal.

B. Multi-conductor control cable, where shown on the Drawings, shall be
stranded, AWG 600V, polyvinyl chloride insulated, nylon jacket over insulation,
polyvinyl chloride jacket overall, Type TC as manufactured by the Okonite Co.;
Pirelli Cable Corp. or equal.

C. The current and voltage sensing cables, identified in the Wiring Schedules on
the Contract Drawings shall be stranded, 600V, polyvinyl chloride insulated,
nylon jacket over insulation, overall shielded, polyvinyl chloride jacket overall,
multi-conductor, plenum rated, Type TC (tray cables) as manufactured by the
Okonite Co., Pirelli Cable Corp., or approved equal. Total number and gauge
of the conductors shall be as shown on the Drawing.

2.04 INSTRUMENTATION WIRE

A. Wire for 4-20 mA, and similar signals shall be:

1. Single pair cable:

   Conductors: 2 #16 stranded and twisted on 2-in lay
   Insulation: PVC with 300 volt, 105 degrees C rating
   Shield: 100 percent Mylar tape with drain wire
   Jacket: PVC with UL and manufacturers identification
   Misc: UL listed for underground wet location use
   Manufacturers: Belden #9316 or equal

2. Multiple pair cables:

   Conductor: Multiple 2 #22 stranded and twisted on a 2-in lay
   Insulation: PVC with 300 volt, 105 degrees C rating
   Shield: Individual pairs shielded with 100 percent Mylar tape and drain wire

   Jacket: PVC with UL manufacturer's identification
   Misc.: UL listed for underground wet location use
Manufacturers: Belden #9330, 9331, 9332, 9333, 9334, 9335, 9336, 9337 or equal.
B. Cables for the Modbus TCP/IP Ethernet:

1. The cables for the Modbus TCP/IP shall be Cat 5e, solid 24AWG copper, four (4) twisted pair, overall Beldfoil shield, with stranded 24AWG drain wire, sunlight and oil resistant PVC jacket Belden #7919A or approved equal.

2.05 SPLICES (POWER CONDUCTORS)

Splices shall be compression type connectors insulated with a heat shrink boot or outer covering and epoxy filling. Splice kits shall be as manufactured by Raychem; Ideal Industries; 3M Co. or equal. Splices shall be located in junction or pull boxes only.

2.06 MOTOR CONNECTIONS

Motor connections shall be ring type mechanical compression terminations installed on the branch circuit wires and the motor leads and secured with bolt, nut and springwasher. Provide insulation by heat shrink boot especially made for motor termination use. Wire nuts, split bolts, etc., are not acceptable. Connections shall be insulated with a Raychem Type MCK, roll-on stub insulator or equal.

2.07 TERMINATIONS AND SPLICES (CONTROL, STATUS AND ALARM CONDUCTORS)

A. Termination connectors shall be of the locking fork-end (upturned leg ends) type as manufactured by Ideal Industries; 3M Co.; Panduit Corp. or equal.

B. Inline or butt type splices of control, status, and alarm conductors are not acceptable. Terminal blocks located in terminal boxes shall be utilized in lieu of splices. Cables shall be continuous between devices.

2.08 TERMINATIONS (INSTRUMENTATION CABLES)

A. Termination connectors shall be of the locking fork-end (upturned leg ends) type as manufactured by Ideal Industries; 3M Co.; Panduit Corp. or equal.

B. Splicing of signal/instrumentation cables is not acceptable. Instrument cables shall be installed in a continuous run from source to destination. If a discontinuity is required, as accepted by the Engineer, provide terminal blocks located in terminal boxes in lieu of splices.

2.09 WIRE AND CABLE MARKERS
A. Wire and cable markers shall be machine printed heat shrink type. No adhesive or clip on labels will be permitted.

B. The control wires shall be provided with identification numbers in accordance with approved schematic diagrams. Each wire shall have a unique number through the entire plant.

C. The power cable conductors shall be provided with identification markers. The identification marker shall be a combination of the load name and phase identification (L1, L2, L3 for three-phase circuit; L1, L2 for single-phase circuit; and N for neutral conductor). For example, P1 L1, P1 L2 and P1 L3 for Pump P1 power conductors.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Uniquely identify/tag all wires, cables and each conductor at each end and in the wireways and pull boxes with wire and cable markers. When the wire is spliced at terminal strip in the junction or pull boxes, identify both ends of the wire.

B. Use lubrications to facilitate wire pulling. Lubricants shall be UL approved for use with the insulation specified.

C. In general, all wires shall be continuous between the points of termination. If splicing of a wire cannot be avoided, it shall be done on properly sized identified terminal board installed in the junction boxes or pull boxes. In the junction boxes, the terminal boards must be attached to a removable backing plate in the box. Terminal boards may not be affixed to any other interior surface, and mounting hardware may not penetrate the exterior of the enclosure.

D. Wiring run from components on a swing-out panel to other components on a fixed panel shall be made up in tied bundles. These shall be tied with nylon wire ties and shall be secured to panels at both sides of the “hinge loop” with mechanical anchors so that conductors are not strained at terminals.

E. Unless otherwise shown, wiring inside the control cabinet shall be run in slotted plastic wireways secured to the cabinet back panel. All control wiring in control cabinet shall be terminated with approved insulated wire ferrules. All field wiring terminating inside the control cabinet shall be terminated with approved insulated wire ferrules. All ferrules shall be crimped in place using manufacturer approved, ratcheting crimping tool.
F. Conformance to the above wiring installation requirements shall be reflected by details shown on the Shop Drawings for the Engineer’s review.
3.02 WIRE COLOR CODE

A. All wire shall be color-coded or coded using electrical tape in sizes where colored insulation is not available. Where tape is used as the identification system, it shall be applied in all junction boxes, manholes and other accessible intermediate locations as well as at each termination.

B. The following coding shall be used:

<table>
<thead>
<tr>
<th>System</th>
<th>Wire</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>120/240 Volts</td>
<td>Neutral</td>
<td>White</td>
</tr>
<tr>
<td>1-Phase, 3-Wire</td>
<td>Line 1</td>
<td>Black</td>
</tr>
<tr>
<td></td>
<td>Line 2</td>
<td>Red</td>
</tr>
<tr>
<td>240/120 Volts, 3-Phase, 4-Wire</td>
<td>Phase A</td>
<td>Black</td>
</tr>
<tr>
<td></td>
<td>Phase B</td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td>Phase C</td>
<td>Blue</td>
</tr>
<tr>
<td>208/120 Volts, 3-Phase, 4-Wire</td>
<td>Neutral</td>
<td>White</td>
</tr>
<tr>
<td></td>
<td>Phase A</td>
<td>Black</td>
</tr>
<tr>
<td></td>
<td>Phase B</td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td>Phase C</td>
<td>Blue</td>
</tr>
<tr>
<td>In Control Cabinets</td>
<td>120 VAC</td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>White</td>
</tr>
<tr>
<td>480Y/277 Volts, 3-Phase, 4-Wire</td>
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<td>Grey</td>
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<tr>
<td></td>
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<td>Brown</td>
</tr>
<tr>
<td></td>
<td>Phase B</td>
<td>Orange</td>
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<td>Phase C</td>
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<td>All Systems</td>
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<td>Green or Bare</td>
</tr>
<tr>
<td>Power Inputs &amp; Outputs</td>
<td>Positive - #18</td>
<td>Orange</td>
</tr>
<tr>
<td>Instrumentation (4-20mA, etc.)</td>
<td>Positive</td>
<td>White</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>Black</td>
</tr>
</tbody>
</table>

3.03 TERMINATIONS AND SPLICES

A. Power Inputs & Outputs: Terminations shall be die type or set screw type pressure connectors as specified.

B. Control Conductors: Termination on saddle-type terminals shall be wired directly with a maximum of two conductors. Termination on screw type terminals shall be made with a maximum of two spade connectors. Provide terminal blocks in the junction boxes in lieu of splices.

C. Instrumentation Signal Conductors (including graphic panel, alarm, low and high level signals): terminations same as for control conductors. If accepted by the Engineer, provide terminal strips in the junction box for conductor extensions.
D. Except where permitted by the Engineer no splices will be allowed in manholes, hand holes or other below grade located boxes.

E. Splices shall not be made in push button control stations, control devices (i.e., pressure switches, flow switches), conduit bodies, etc.

3.04 INSTRUMENTATION CABLES

A. Instrumentation cables shall be installed in raceways as specified. All circuits shall be installed as twisted pairs. In no case shall a circuit be made up using conductors from different pairs.

B. Terminal blocks shall be provided at all instrument cable junctions, and all circuits shall be identified at such junctions.

C. Shielded instrumentation wire, coaxial, data highway and I/O cables shall be run without splices between instruments, terminal boxes, or panels.

D. Shields shall be grounded as recommended by the instrument manufacturer and isolated at all other locations. Terminal blocks shall be provided for interconnecting shield drain wires at all junction boxes. Where individual circuit shielding is required, each shield circuit shall be provided with its own block.

E. DC and instrumentation cabling shall not be run in the same wireways as AC wiring. Where it is necessary for conflicting systems to be in close proximity, maintain at least 6 inches of separation where possible. AC and DC/signal wiring shall cross only at perpendicular angles.

3.05 FIELD TESTING

A. Perform City-witnessed continuity and megohmmeter tests of all wiring prior to termination to confirm no ground fault exists from conductor to conductor or conductor to ground. Any installations that do not pass shall be corrected and retested.

1. Perform Megohmmeter tests of all control and power conductors. The tests shall use 500 VDC for 1 minute. Each conductor shall be tested to ground, and from conductor-to-conductor. The insulation resistance shall be 20 megohms or more. Tests shall be in accordance with NETA Standards 7.3.1.2 and 7.3.1.3 as detailed in Section 16 96 00. Results shall be tabulated and submitted to the Engineer for review.

2. Test control wires before terminating to any control device. The Contractor is responsible for any damage to components (instrumentation, etc.) not isolated from the test voltage.
B. Any installations that do not pass the tests above shall be corrected and retested.

C. Written test reports for all cable runs shall be prepared in accordance with NETA guidelines for utility and 480V feeder cable runs as a minimum before energization of the cable.

D. Written test reports for the identified cable runs shall be submitted to the Engineer for acceptance before energization of the cable. If any remedial action was required to achieve a passing grade, describe the corrections performed.

END OF SECTION
SECTION 16 14 10
WIRING DEVICES

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidental items required and install a complete system of wiring devices ready for use as specified herein, as shown on the Drawings, and required to complete the work.

1.02 RELATED WORK

A. Electrical - General Provisions are included in Section 16 00 00.
B. Raceways, Boxes, Fittings, and Supports are included in Section 16 11 00.

1.03 SUBMITTALS

A. All submittals shall be in accordance with Sections 01 32 19 and 16 00 00.
B. Product data and catalog sheets for all wiring devices to be furnished.

1.04 REFERENCE STANDARDS

All wiring devices shall be in accordance with the National Electric Code (NEC) and UL listed and labeled.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Switches

1. Wall switches shall be of the indicating toggle action, flush mounting quiet type. All switches shall conform to Federal Specification WS 896-E.

2. Wall switches shall be of the following types and manufacturer.

   a. Single pole, toggle maintained, 20A, 120/277V as manufactured by Leviton, Hubbell, Inc. or approved equal.

   b. Three way switches, toggle maintained, 20A, 120/277V as manufactured by Leviton, Hubbell, Inc. or approved equal.
B. Receptacles

1. Receptacles shall be of the following types and manufacturer. Receptacles shall conform to Federal Specification WC596-F.
   
   a. Weatherproof/corrosion resistant duplex, 20A, 125V, 2P, 3W, with yellow melamine body with non-metallic or fiberglass, corrosion-resistant, gasketed snap plate for weatherproofing, and PVC coated type back box; Crouse-Hinds Co., Harvey Hubbell, Inc., Pass & Seymour, Inc., or approved equal.
   
   
   c. Duplex receptacles shall be NEMA 5-20R.
   
   d. The receptacles exposed to weather or outside shall be 20A, 125V, 2 pole, 3 wire grounding with watertight safety shroud rated for NEMA 4X environmental while in use or when closed as manufactured by Hubbell or approved equivalent.
   
   e. One dedicated receptacle for Frontier cabinet on exterior surface of north wall of the building shall be non-GFI weatherproof type. The receptacle shall have in-service weatherproof cover.
   
   f. Receptacles installed in vaults for powering sump pumps shall not be GFCI protected. Weatherproof “in service” covers shall be installed for receptacles to be used for sump pumps. Circuit breaker for these receptacles shall be GFCI protected.

C. Device Plates

1. Plates for flush mounted devices shall be of the required number of gangs for the application involved and shall be 302 (18-8) high nickel stainless steel of the same manufacturer as the device.

2. Plates for surface mounted device boxes shall be of the same material as the box.

PART 3 - EXECUTION

3.01 APPLICATION

Provide devices suitable for the area designations shown on the Drawings. In areas designated NEMA 3R or 4 on the Drawings, provide corrosion-resistant type with non-metallic or ferrous material with epoxy finish, corrosion-resistant, gasketed snap plate and non-metallic backbox.

3.02 INSTALLATION

A. Unless noted otherwise on the Drawings, switches shall be mounted 48 inches above the finished floor; receptacles in wet or process areas shall be mounted 36 inches above the floor or finished grade, receptacles in dry areas shall be mounted at 18 inches above the floor.

B. Switches in belowground vault shall be installed near access hatch and close to bottom of the ceiling.

C. Switch and receptacles outlets shall be installed flush with the finished wall surfaces when raceways are shown as concealed on the Drawings.

D. Receptacles installed in vaults for powering sump pumps shall not be GFCI protected. Weatherproof “in service” covers shall be installed for receptacles to be used for sump pumps.

END OF SECTION
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SECTION 16 19 10
MISCELLANEOUS ELECTRICAL MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and install miscellaneous electrical material and equipment as shown on the Drawings, as specified herein, and as required to complete the Work.

1.02 DESCRIPTION

This Section provides the requirements for miscellaneous material and electrical equipment typically employed in a facility; however, not all components specified in this Section may necessarily be utilized in the Work.

1.03 RELATED WORK

A. Electrical General Provisions are included in Section 16 00 00.

B. Electrical System Testing is included in Section 16 96 00.

1.04 SUBMITTALS

A. All submittals shall be in accordance with Sections 01 32 19 and 16 00 00.

B. Submittals shall include detailed catalog information or drawings describing electrical and physical characteristics of all material and equipment to be furnished.

PART 2 - PRODUCTS

2.01 GENERAL

A. Equipment enclosures shall have NEMA ratings suitable for the location in which they are installed, as specified in Section 16 00 00.

B. Miscellaneous electrical equipment components and devices shall be UL listed and labeled where UL standards exist for such equipment.
2.02 MATERIALS

A. Disconnect Switches

1. Disconnect switches shall be heavy-duty, quick-make, quick-break, visible blades, 600 volt, 3 pole with full cover interlock, interlock defeat and flange mounted operating handle. Door mounted operating mechanisms are not acceptable.

2. Switches used as motor disconnects shall be horsepower rated.

3. Switches shall be as manufactured by Cutler-Hammer.

B. Equipment Identification, Nameplates and Labels

1. All field mounted electrical equipment, such as disconnects, push button stations, etc., shall be provided with a weather resistant equipment identification nameplate. Nameplate shall identify the mechanical equipment controlled exactly as shown on the electrical drawings.

2. Nameplates

   a. Nameplates shall be weather resistant, UV-stable, engraved type, 2-ply fused core, laminated plastic. Minimum size shall be as shown on the Drawings or in individual sections, but in no case shall it be less than 1/16-in. thick by 3/4-in. by 2-1/2-in. Color shall be black.

   b. Letters shall be at least 1/4-in. high and white on a black background. The characters shall be engraved and shall be sized so they can be easily read with variations in size to denote relative importance.

   c. Nameplates shall be screw mounted to NEMA 1 enclosures. Nameplates shall be bonded to all other enclosure types using an epoxy or similar permanent waterproof adhesive.

   d. Two-sided adhesive foam or tape is not acceptable.

   e. Where the equipment size does not have space for mounting a nameplate the nameplate shall be permanently fastened to the adjacent mounting surface.

   f. Hardware shall be stainless steel.
3. Labels and Markers

   a. Wire markers shall be heat shrink and machine printed only. No adhesive or clip on labels will be permitted.

   b. Removable control relays shall be affixed with labels as well as the sockets. Relay labels shall be affixed with 2-part epoxy glue.

   c. Terminal block identification labels shall be machine printed only and approved by the terminal block manufacturer.

C. Thermostats

   Line Voltage Thermostat shall have contacts rated for direct start and stop of a 120VAC, 1HP exhaust fan motor. The thermostat contacts shall close on temperature rise, and the thermostat range shall be 35 – 100 degrees F. The thermostat shall be Dayton Model 2NNT2, or approved equal.

D. Pull Boxes and Manholes

   1. Pull boxes and manholes shall be precast concrete, heavy-duty type, and conform to ASTM C478.

   2. The minimum sizes of pull boxes and manholes shall be as shown on the Drawings, however larger size shall be provided as required to accommodate required number of conduits, suit field condition, or as required by SCE.

   3. Pull boxes for utility company shall be in accordance with the requirements of the utility company and as shown on the Drawing.

   4. Pull boxes shall be ordered with the appropriate number of knockouts or terminators to accommodate the conduits.

   5. All pull boxes and manholes within vehicle travelled areas, asphalt or concrete paved areas, and as identified on the Drawings shall be designed for a Class H-20 wheel load. Pull boxes and manholes in other areas shall be designed for Vehicle Parkway Loading.

   6. Precast units shall be as manufactured by Chase Precast Corp., American Precast Co., or approved equal.

E. Frames and Covers
Frames and covers for manholes and pull boxes shall be cast iron, heavy-duty type. Loading rating shall be the same as for pull boxes or manholes as applicable.

F. Frontier Termination Cabinet

The cabinet shall be 20 inches wide, 32 inches high and 6 inches deep minimum. The cabinet shall be provided with 3/4-inch thick plywood back panel, hasp for providing padlock, and #6AWG ground wire. The cabinet shall be weatherproof and NEMA 3 rated.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Items shall be installed in accordance with the manufacturer’s written recommendations.

B. Frontier cabinet shall be mounted in accordance with manufacturer’s written recommendations and as approved by Frontier. Cabinet shall not be directly mounted on wall. It shall be mounted on wall-mounted galvanized supports and tubing and using stainless steel hardware and anchors. Exact location shall be determined in field as approved by Frontier and the City.

C. Precast Manhole and Pull Boxes

1. Set each commercial precast assembly on 6 inches, 95 percent compacted crushed aggregate base, extending 12 inches beyond the edge of the assembly each side. Locate and place the frames and covers to within 1/8-inch vertical elevation all around in paved areas and to ½-inch in other areas.

D. Painting

1. Cast-iron frames and covers not buried shall be cleaned to remove rust, grease, dirt, and other deleterious materials, and coated with bituminous paint. Steel frames and covers not buried shall be cleaned to remove rust, grease, dirt, and other deleterious materials. Steel surfaces shall be prepared using blasting or wire brush. Immediately after preparation of surfaces, coat surfaces with a pretreatment coating. As soon as practicable after the pretreatment coating has dried, apply a coat of zinc chromate primer and one coat of synthetic exterior gloss enamel.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to design, install, maintain and repair temporary 120/240 VAC electrical power system and control system during construction period as specified herein and as required to facilitate continuous operations of the existing facilities.

B. The Contractor shall use the existing radio communication system until new communication system is established.

C. The Contractor may use existing power 120/240 VAC electrical power system and PLC/RTU system as long as it is feasible and until new systems are established and functional.

D. The Contractor is solely responsible for the design, installation, maintenance, and repair work of the temporary power and control systems as needed.

E. Provide field services of qualified persons to operate, maintain and service the temporary electrical power and control systems.

F. Remove all temporary power and control systems after they are no longer required.

G. The Contractor shall switch over from the existing power and control systems to temporary or new power and control systems within 4 hours.

H. The Contractor shall switch over from the temporary power and control systems to new power and control systems within 4 hours.

I. The Contractor shall switch over from the existing communication system to new within 4 hours.

1.02 RELATED WORK

A. Temporary Utilities are included in Section 01 51 00.

B. Electrical General Provisions are included in Section 16 00 00.
1.03 SUBMITTALS

A. In accordance with Section 01 32 19, submit the following to the Engineer for approval:

1. A drawing showing proposed layout and location of the source of 120/240VAC temporary power.

2. Drawings showing proposed layout, location, and details of 120/240VAC temporary electrical power distribution system and its components including conduits, cables, and wires.

3. Drawings showing proposed layout, location, and details of temporary control (PLC/RTU) system.

4. Detail technical data for each major component of the temporary power and control systems.

1.04 EXISTING 120/240VAC ELECTRICAL SYSTEM AND COMPONENTS

A. Existing electrical system is comprised of 120/240VAC, 1 Phase, 3W, 90 Amp power supply from SCE. The SCE power supply pedestal with meter is located on the west side of the La Granada Reservoir access road approximately 120' north of Mountain Crest Circle cul-de-sac.

B. 120/240 VAC power panel (distribution panel with circuit breakers) is located at the La Granada Reservoir site next to the steel tank in a steel enclosure. From the power panel, electrical power is supplied to the following components.

1. 7.5HP irrigation pump and starter
2. Irrigation controller
3. Local receptacles
4. Telemetry unit
5. Radio system
6. Steel tank cathodic protection system
7. Local lights
8. Reservoir controls and instruments, such as water level transmitter
9. Seismic valve power
10. Seismic valve controls
11. Pax Mixer for La Granada Reservoir

C. Refer to as-built drawings for additional information. The Contractor is reminded that the as-built data is not complete and accurate. Information pertaining to modifications made after preparation of the as-built drawings may not be
shown. The Contractor shall visit the site to confirm existing electrical system and its components.

1.05 EXISTING CONTROL (RTU/PLC) AND COMMUNICATION SYSTEMS

A. Existing RTU/PLC is located inside a cabinet adjacent to the existing La Granada Reservoir near the front gate.

B. Existing communication system is comprised of radio and antenna. Radio equipment is located inside a cabinet adjacent to the existing La Granada Reservoir near the front gate. Antenna is located on top of the existing reservoir roof.

C. Signals from water level transmitter, seismic valve system, existing flow meter, and Pax mixer are transmitted using existing RTU/PLC and communication system.

1.06 EXISTING FACILITY OPERATIONS REQUIREMENTS

A. During construction, the following existing components shall remain in service at a minimum, unless otherwise approved by the City in writing.

1. Local receptacles
2. Telemetry unit
3. Radio communication system
4. Steel tank cathodic protection system
5. Local lights
6. Reservoir controls and instruments, such as water level transmitter
7. Seismic valve power
8. Seismic valve controls
9. Pax Mixer for La Granada Reservoir
1.07 USE OF EXISTING ELECTRICAL POWER SUPPLY, RTU, AND COMMUNICATION SYSTEMS

A. Electrical Power:

1. The Contractor may use the existing electrical power supply and equipment to keep existing facilities operational as long as it is feasible and until new 120/240VAC system is installed and functional.

2. If required, modifications to existing electrical distribution system shall be performed as required to provide electrical power to existing facilities that are temporarily required to be relocated or temporarily replaced with new to facilitate new construction. Modifications shall include relocation of existing devices and installation of temporary conduits and wires as required to keep the devices operational.

3. If the existing electrical power system is not used or not feasible to use, the Contractor shall install temporary electrical system to keep specified existing facilities in operation.

B. RTU/PLC:

1. The Contractor may use the existing RTU/PLC as long as it is feasible and until new PLC and communication systems are installed and functional.

2. If the existing RTU/PLC system is not used or not feasible to use, the Contractor shall install temporary system to keep specified existing facilities in operation.

C. Communication System:

1. The Contractor shall use the existing communication system until new PLC and communication systems are installed and functional.

1.08 TEMPORARY ELECTRICAL POWER AND RTU/PLC SYSTEM

A. The Contractor shall be solely responsible for obtaining required temporary electrical power to keep existing facilities in operation as specified in Paragraph 1.05.

B. The temporary power may be derived from portable diesel generator or from SCE supply.

C. The Contractor shall be solely responsible for installing required temporary RTU/PLC (control) system to operate existing specified components.
1.09 EXISTING FACILITIES TO BE TEMPORARILY RELOCATED OR REPLACED WITH NEW

A. The following facilities/items that are required to be operational during construction will be required to be temporarily relocated or replaced with new to facilitate new construction.

1. Irrigation piping
2. Irrigation control valves
3. Others as required for construction purpose

B. The items listed in 1.09.A or any other items required to be relocated because of Contractor’s operations shall be provided with temporary electrical power either by modifying the existing power system or providing new temporary electrical system as required and as specified herein.

C. All items listed in 1.09.A or any other items required to be relocated because of Contractor’s operations shall be made functional by furnishing and installing all required auxiliary appurtenances, including piping, valves, conduits, wires, etc. as needed.

1.10 COORDINATION

The Contractor shall provide all required coordination with the City, Engineer, and SCE for installing and maintaining the temporary power and control systems.

PART 2 - PRODUCTS

2.01 GENERAL

A. The Contractor may use the existing available facilities as specified herein.

B. Unless otherwise noted, the Contractor shall furnish all required material, components, equipment, miscellaneous items, accessories, and appurtenances to provide temporary power and control systems as specified herein. Materials may be used or new. All materials shall meet applicable codes.
PART 3 - EXECUTION

3.01 INSTALLATION

A. The Contractor shall be solely responsible for the design, delivery, installation, maintenance, and repair of temporary power and control systems as specified herein.

B. All installations shall meet applicable codes. The installation of temporary power and controls shall meet requirements of the National Electrical Code and all regulations of the local authorities.

C. Protect conduits, cables, and wires from physical damage during construction.

D. Demolition of the existing power and control systems shall not be performed until temporary or permanent systems are installed.

E. Switch over from the existing power and control systems to the temporary or new permanent systems shall be performed within the time limit as specified in Paragraph 1.01.F.

F. The Contractor shall provide at least two Work Days’ advance notice to the City prior to switching to the temporary power and control systems.

3.02 OPERATION, MAINTENANCE AND REPAIR

A. The Contractor shall maintain temporary power and control systems for throughout the course of the construction work.

B. The Contractor shall provide all required consumable and maintenance products, replacement parts, tools, labor and services of qualified personnel to maintain and satisfactorily operate all components of the temporary power and control systems during the entire course of the project.

C. Cost of electrical power to operate existing facilities will be paid by the City directly to SCE.

D. The Contractor shall repair any damaged components of the temporary power and control systems without delay.

3.03 REMOVAL AND SALVAGE OF EXISTING AND/OR TEMPORARY POWER, CONTROL AND COMMUNICATION SYSTEMS

A. Prior to start of removal of the existing and/or temporary components affecting operations of the existing facilities, all required installation of new components
shall be complete. All materials required to switch over to the new system shall be on hand and ready for installation to ensure that the switch over is completed within the specified time period.

B. Switchover from the to the new shall be performed within the time limit as specified in Paragraph 1.01.

C. The Contractor shall remove existing and/or temporary power, control, and communication systems after they are no longer required.

D. All components removed by the Contractor shall be disposed of, except the following devices which shall be delivered to the City’s yard.

   1. Radio
   2. RTU/PLC

END OF SECTION
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PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install the 480/277 Volt switchboard as shown on the Drawings, as specified herein, and as required to complete the work.

B. The switchboard shall be complete and include all required appurtenances and accessories for complete installation and specified functionality.

1.02 RELATED WORK

A. Electrical General Provisions are included in Section 16 00 00.

B. Motor Control Center is included in Section 16 60 00.

C. Grounding is included in Section 16 70 00.

D. Standby Diesel Engine Power Generator Set – 480 VAC is included in Section 16 70 50.

E. Automatic Transfer Switch is included in Section 16 80 00.

F. Control Cabinet and Controls are included in Section 16 90 00.

G. Electrical System Testing is included in Section 16 96 00.

H. Short-Circuit Fault Current, Protective Device Coordination, and Arc Flash Studies are included in Section 16 96 10.

I. Field Instrumentation is included in Section 17 40 00.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Sections 01 32 19 and 16 00 00, shop drawings and product data, for the following:

1. Equipment shop drawings showing elevation and plan views, compartment arrangement, dimensions, weight, shipping splits and metering layouts.
2. Single line diagrams, three-line diagrams, point-to-point compartment wiring diagrams for metering, relay and control circuits. Show wire and terminal numbers.

3. Bus material, ratings and insulation details.

4. Product data sheets and catalog numbers for circuit breakers. List all options, trip adjustments and accessories furnished specifically for this project.

5. Equipment support calculations, including seismic anchoring and anchor bolt sizing, as required per Sections 16 00 00 and 55 00 00.

6. Painting and coating data.

B. After favorable review by the Engineer, submit a complete submittal package for the equipment as described in Paragraph 1.03.A for SCE review and approval. Wiring, three-line, and elementary diagrams shall be stamped by a qualified Professional Engineer registered in California. Equipment shall be as approved by SCE.

C. Field test reports.

D. Submit bound operating and maintenance manual. Manuals shall include the following as a minimum:

1. A comprehensive index.

2. A complete "Record" set of approved shop drawings.

3. A complete list of the equipment supplied, including serial numbers, ranges and pertinent data.

4. Detailed service, maintenance and operation instructions for each item supplied.

5. All test reports, including shop and field tests.

1.04 REFERENCE STANDARDS

Switchboard shall be designed, built, and tested in accordance with the latest editions and revisions of NEMA Standard PB-2 and Underwriters Laboratories (UL) Standard No. UL-891. Switchboard shall also comply with any applicable ANSI and IEEE Standards and the requirements of the National Electric Code (NEC).
1.05 QUALITY ASSURANCE

A. The equipment furnished under this Section shall be the product of a manufacturer who has produced this same type of equipment for a period of at least 5 consecutive years.

B. The switchboard shall be designed, assembled and tested by the manufacturer of the circuit protective devices used in the switchboard.

C. The equipment and major components shall be suitable for and meet all applicable seismic requirements of the California Building Code (CBC).

1.06 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions.

B. Breakers and accessories shall be packaged and shipped separately.

C. Switchgear shall be equipped for handling by crane. Where cranes are not available, switchgear shall be suitable for skidding in place on rollers using jacks to raise and lower the groups.

D. Prior to installation, switchgear shall be stored to maintain the equipment in a clean and dry condition. If stored outdoors, indoor gear shall be covered and heated, and outdoor gear shall be heated.

1.07 FACTORY INSPECTION AND TESTING

Manufacturing, fabrication, assembling, and testing of all switchgear shall be subject to inspection by the City's Materials Inspector at the place of manufacture regardless of location.

PART 2 - PRODUCTS

2.01 RATINGS

A. Service: 480/277 Volt, 3 Phase, 4 Wire, 60 Hz, 800A.

B. The switchboard and protective devices shall be fully rated for the short circuit current of 42 kA. Underground pull section and metering shall be rated for 800A.

C. The manufacturer shall design switchboard, including devices, for continuous operation at its rated current in a 40 degree C ambient temperature.
D. Switchboard shall be UL listed.

E. Automatic Transfer Switch (included in Section 16 80 00) shall be part of the switchboard lineup and include the transition sections form switchboard to ATS and ATS to MCC as shown on the drawings.

2.02 CONSTRUCTION

A. Structure

1. Switchboard shall be NEMA 1 type, free standing, front accessible, completely metal enclosed and sectionalized to isolate and minimize the effects of internal short circuit currents. Sections shall line up front and rear. Maximum dimensions allowed for each switchboard are shown on the Drawings.

2. Side and top covers shall be code gauge steel, bolted to 12-gauge minimum frame structure members. Front and rear doors shall be flush, hinged, with screw fasteners.

3. Paint material shall be epoxy with 3 to 5 mils thickness. Paint procedures and materials shall be manufacturer’s system designed and proven for resistance to chemical attack in industrial powerhouse environments. Unless otherwise specified, cabinet paint shall be Z55.1ANSI 61 Gray. All unit interior surfaces shall be painted white for better visibility inside the unit. The paint shall be applied using an electro-deposition process to ensure a uniform paint coat with high adhesion.

B. Buses

1. All buses shall be silver plated copper.

2. Buses shall be braced for the specified equipment short circuit current rating.

3. Provide a copper ground bus extending throughout the entire length of the switchboard, equipped with lugs for external ground connections, sized for cables shown on the Drawings.

C. ATS switch

1. The ATS shall include two circuit breakers, rated 800A each and mechanically interlocked. It should not be possible to close both circuit breakers at the same time. The ATS switch normal power breaker shall function as the electrical service main circuit breaker. ATS shall be per Section 16 80 00.
D. Marking and Identification

1. Nameplates shall be provided for each circuit breaker. Nameplates shall be in accordance with Section 16 19 10.

2. A manufacturer's plaque shall be fastened to the front of each switchboard. The plaque shall indicate model number, serial number, amperes, volts, short circuit rating, etc.

3. Each switchboard shall be furnished with a sign marked "DANGER - 480 VOLTS KEEP OUT." Letters shall be not less than 1-inch high, 1/4-inch stroke. Signs shall be adhesive backed Mylar, OSHA approved.

2.03 EQUIPMENT SUPPORT

The Contractor shall design and fabricate structural support members for equipment. Provide calculations and shop drawings for the proposed structural support system for Engineer’s approval. Steel support members shall be galvanized and painted. All hardware shall be stainless steel.

2.04 SCE APPROVAL

The equipment shall be reviewed and approved by SCE.

2.05 MANUFACTURERS

Switchboard shall be Type Pow-R-Line C by Cutler-Hammer - Eaton or approved equal meeting the requirements of this Section and SCE.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be in accordance with the manufacturers' instructions.

B. The switchboard shall be arranged so that the uppermost operating handle shall not exceed 6 feet from the equipment base/floor.

C. Field wiring shall be grouped by circuit and tie wrapped. Terminations shall not be stressed.

D. Attach freestanding panelboards to concrete equipment pads using anchors. Anchor bolts shall be sized and installed in accordance with the submitted seismic calculations. Grout and caulk all voids beneath the equipment base.
3.02 FIELD TESTING AND SERVICES

A. Manufacturer's installation and commissioning representatives specifically trained in the installation of the equipment shall supervise the installation and make adjustments, repairs, corrections, and perform fine-tuning, startup, testing, and final adjustment tasks of the equipment furnished.

B. Field testing shall be performed in the presence of the City's representative and per the requirements of Sections 16 00 00 and 16 96 00 and as supplemented herein. Field testing procedures shall duplicate as nearly as possible the conditions of operation and shall be selected to demonstrate that the equipment is operational and free from damage. Testing procedures shall demonstrate that the equipment has been properly serviced, aligned, connected, calibrated, and adjusted prior to operation.

C. Megger terminals and buses at two times rated voltage, phase-to-phase and phase-to-ground after disconnecting devices sensitive to megger voltage.

D. Adjust and test all circuit breakers and relays.

E. Prepare and submit reports for all tests in accordance with Section 16 96 00.

3.03 CLEANING

Remove all rubbish and debris from inside and around the switchboard. Remove dirt, dust, adhesives, tapes, stickers, or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner, or clean, lint-free rags. Do not use compressed air.

END OF SECTION
SECTION 16 60 00
MOTOR CONTROL CENTER

PART 1 - GENERAL

1.01 GENERAL

Furnish all labor, materials, equipment and incidentals required to install Motor Control Center (MCC) as shown on the Drawings, as specified herein, as required to complete the work.

1.02 RELATED WORK

A. Electrical General Provisions are included in Section 16 00 00.
B. 480 Volt Switchboard is included in Section 16 50 00.
C. Grounding is included in Section 16 70 00.
D. Standby Diesel Engine Power Generator Set – 480 VAC is included in Section 16 70 50.
E. Automatic Transfer Switch is included in Section 16 80 00.
F. Control Cabinet and Controls are included in Section 16 90 00.
G. Electrical System Testing is included in Section 16 96 00.
H. Short-Circuit Fault Current, Protective Device Coordination, and Arc Flash Studies are included in Section 16 96 10.
I. Field Instrumentation is included in Section 17 40 00.

1.03 REQUIREMENTS

The MCC shall conform to Underwriters Laboratories (UL) 845 current revision, EEMAC, NEMA ICS-2 and the latest version of the National Electric Code. The MCC must be manufactured in an ISO 9002 certified facility.

1.04 SUBMITTALS

A. Submit to the Engineer, in accordance with Sections 16 00 00, shop drawings and product data for the following:
1. Drawings showing elevation, plan, layouts, and details of enclosure and components, including any “shipping breaks.”

2. Wiring, three-line and elementary diagrams.

3. Component list.

4. Nameplate schedule.

5. Conduit entry/exit locations.

6. Technical data for all components to be furnished and installed, including circuit breakers, protective relays, motor combination starters, potential and current transformers, lighting panel, etc.

7. Painting and coating data.

B. After favorable review by the Engineer, submit a complete submittal package for the MCC as described in Paragraph 1.03.A, including protective relaying scheme, manufacturer data for relays, and wiring, elementary, and three-line diagrams for SCE review and approval. Wiring, elementary, and three-line diagrams shall be stamped by a qualified Professional Engineer registered in the State of California.

C. Equipment support calculations, including seismic anchoring and anchor bolt sizing, as required per Sections 16 00 00 and 55 00 00.

D. Certified shop test reports.

E. Field test and inspection reports.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

The Motor Control Center and its components shall be Freedom 2100 as manufactured by Cutler Hammer or approved equal, 480V, 3phase, 3 wires, 800 Amperes.
2.02 MCC CONSTRUCTION

A. Structures

1. The MCC structures shall be totally enclosed, dead front, freestanding assemblies. The structures shall be capable of being bolted together to form a single assembly.

2. The overall height of the MCC (excluding base channel) shall not exceed 90" (2286 mm). The overall width of the MCC and the control cabinet shall not exceed dimensions indicated on the Drawings.

3. The MCC shall be general purpose NEMA/EEMAC 1.

4. All unused space shall be covered by hinged blank doors and equipped to accept future units. Vertical bus openings shall be covered by manual bus shutters.

5. Each section shall include top and bottom removable plates for ease in cutting conduit entry openings.

B. Barriers

1. All power bussing and splice connections shall be isolated from the unit compartments and the wireways. The horizontal bus shall be mounted into a glass-filled polyester support assembly that braces the bus against the forces generated during a short circuit. The horizontal bus shall be isolated from the top horizontal wireway by a two-piece grounded steel barrier. For maintenance purposes, this barrier shall be removable to allow access to the bus and connections.

2. The vertical bus shall be housed in a molded glass-filled polyester support that provides bus insulation and braces the bus against the forces generated during a short circuit. These supports will have openings for unit stab-on connections. Each opening shall be provided with a manual shutter to close off the stab opening.

3. Barriers shall be provided in the vertical structure and unit designs to prevent the contact of any energized bus or terminal by a fishtape inserted through the conduit or wireway areas.

C. Bussing

1. All bussing and connectors shall be silver-plated copper.

2. The main horizontal bus shall be rated at 800A continuous and shall extend
the full length of the motor control center. Bus ratings shall be based on a 65°C maximum temperature rise in a 40°C ambient.

3. The sections (vertical busses) shall be provided with 600A rated bus connections to the main horizontal bus. This bus connection shall be of the same material and plating as the main horizontal bus.

4. A tin-plated copper ground bus that runs the entire length of the motor control center shall be provided. The ground bus shall be rated for 300 amps. A compression lug shall be provided in the motor control center for the ground cable. For any loads requiring a ground conductor, the ground bus shall be provided with holes for each vertical section to accept ground lugs.

5. The power bus system shall be braced for a short circuit capacity of 42,000 RMS amperes minimum.

D. Unit Construction

1. A cast metal handle operator must be provided on each disconnect. With the unit stabs engaged into the vertical phase bus and the unit door closed, the handle mechanism shall allow complete on/off control of the unit disconnect with clear indication of the disconnect's status. All circuit breaker operators shall include a separate tripped position to indicate clearly a circuit breaker trip condition. It shall be possible to reset a tripped circuit breaker without opening the control unit door.

2. A mechanical interlock shall prevent an operator from opening the unit door when the disconnect is in the on position. Another mechanical interlock shall prevent an operator from placing the disconnect in the on position while the unit door is open. It shall be possible for authorized personnel to defeat these interlocks.

3. A non-defeatable interlock shall be provided between the handle operator and the cam lever to prevent installing or removing a plug-on unit unless disconnect is in the off position.

4. Provisions shall be provided for locking all disconnects in the off position.

E. Wireways

1. The structures shall contain a minimum 12" (305mm) high horizontal wireway at the top of each section, and a minimum 6" (152mm) high horizontal wireway at the bottom of each section. These wireways shall run the full length of the motor control center to allow room for power and control cable to connect between units in different sections.
2. A full-depth vertical wireway shall be provided in each motor control center section that accepts modular plug-on units. The vertical wireway shall connect with both the top and bottom horizontal wireway, and shall be isolated from unit interiors by a full height barrier. The vertical wireway shall be 4" (102mm) wide minimum, with a separate hinged door. Access to the wireways shall not require opening control unit doors. Structures that house a single full-section control unit shall not be required to have vertical wireways.

F. MCC Finish

1. Paint material shall be epoxy with 3 to 5 mils thickness. Paint procedures and materials shall be manufacturer’s system designed and proven for resistance to chemical attack in industrial powerhouse environments. Unless otherwise specified, cabinet exterior paint shall be Z55.1ANSI 61 Gray. All unit interior surfaces shall be painted white for better visibility inside the unit. The paint shall be applied using an electro-deposition process to ensure a uniform paint coat with high adhesion.

G. Terminal Blocks

1. All starter units shall be provided with unit control terminal blocks. The terminal blocks shall be pull-apart, 600V, and rated at 25 amperes. All current-carrying parts shall be tin-plated. The terminal blocks shall be din rail mounted, with the stationary portion of the block secured to the unit bottom plate. The terminals used for field connections shall face forward so they can be wired without removing the unit or any of its components.

H. Nameplates

1. Nameplate shall be in accordance with Section 16 19 10.

2. A manufacturer’s plaque shall be fastened to the front of each switchboard. The plaque shall indicate model number, serial number, amperes, volts, short circuit rating, etc.

2.03 EQUIPMENT SUPPORT

The Contractor shall design and fabricate structural support members for equipment. Provide calculations and shop drawings for the proposed structural support system for Engineer’s approval. Steel support members shall be galvanized and painted. All hardware shall be stainless steel.
2.04 COMPONENTS

A. Circuit Breakers

1. Circuit breakers shall be of the thermal magnetic trip type and shall have quick-break toggle mechanisms, inverse time-limit characteristics, and shall be trip free on overload and short circuit. Automatic tripping and position of the breakers (open or closed) shall be clearly visible from the front of the panel. The interrupting duty of each circuit breaker shall be not less than 42,000 amps RMS at 480 volts when tested in accordance with NEMA Standards.

B. Motor Combination Starters

1. General. Motor combination starters shall consist of motor circuit protectors or circuit breaks and soft starters, and necessary wiring.

2. Motor circuit protectors shall be of the magnetic trip type and shall have quick-break toggle mechanisms, and shall be trip free on short circuit. Automatic tripping and position of the breakers (open or closed) shall be clearly visible from the front of the panel. The interrupting duty of each circuit protector shall be not less than 42,000 RMS at 480 volts when tested in accordance with NEMA Standards.

3. Motor starters shall be soft starter type and sized for the motors as shown on the Drawings. The starters shall conform to the adopted standards and recommended practices of the Industrial Control Standards of the National Electrical Manufacturer's Association and the Standard for Industrial Control Equipment of the Underwriters Laboratories.

C. Potential and Current Transformers

1. Potential transformers: Two-winding, encapsulated with primary and secondary fuses. Voltage ratings shall be as required for the application. Thermal rating and metering accuracy in accordance with ANSI standards.

2. Current transformers: Toroidal type suitable for mounting on starter bus. Continuous thermal current rating, relaying and metering accuracy shall conform to ANSI standards.

D. Solid State Soft Starters

2. Motor circuit protectors shall be of the magnetic trip type, shall have quick-break toggle mechanisms, and shall be trip free on short circuit. Automatic tripping and position of the circuit protectors (open or closed) shall be clearly visible from the front of the panel. The interrupting duty of each circuit protector shall be not less than 42,000 RMS at 480 volts amperes when tested with NEMA Standards.

3. Solid-state soft starters shall be sized for the pump motors as shown on the drawings. The amount of the starting current shall be field adjustable to match the requirements of the application. The standard feature shall include soft start, soft stop, phase loss and stall protection. The starter shall be provided with pump control option. The starters shall conform to the adopted standards and recommended practices of the Industrial Control Standards of the National Electrical Manufacturers Association and the Standard for Industrial Control Equipment of the Underwriters' Laboratories, Inc. The starter shall provide motor overload protection to protect motor from continuous overloading.

4. The starter shall be Eaton Corporation Model S811+ with pump control option or approved equal.

E. Lighting Panel

1. Lighting panel shall be 120/240 volt, single phase, 3-wire, 60 hertz. The power shall be derived through transformation of the 480 volt system.

2. Lighting panel shall be circuit breaker type panelboard with quick-make and quick-break mechanisms on manual operation, trip free, with inverse time characteristics. The panelboard assembly shall be so designed that any individual breaker can be removed without disturbing adjacent units or without loosening or removing supplemental insulation. Bus bars shall be fastened securely to bases and shall not depend upon breakers for support. Cabinet box shall be flush mounted steel construction NEMA 1 enclosure, mounted in a section of the switchboard. It shall be prime-coat painted and finished-coat painted in light color enamel. Box gauges shall conform to Underwriters Laboratories requirements except in no case lighter than 14 gauge. The lighting panel shall be provided with a cover of not less than 12 gauge. A suitable index shall be provided on the inside of the switchboard compartment door for labeling and defining the load of each circuit.

3. The minimum number of circuit breakers shall be as shown on the Drawing, including spare circuit breakers.
F. Lighting Transformer

1. Lighting transformer shall be single phase, 60-cycle, 480 volt primary, 120/240 volt secondary, dry type transformer, size as noted on the Drawings. The transformer shall be general purpose type for indoor installation with Class H insulation, 150°C rise conforming to the applicable requirements of ANSI and NEMA.

2.05 SHOP TESTS

A. The MCC shall be tested in accordance with the applicable standards of the American National Standards Institute, Institute of Electrical and Electronic Engineers and the National Electrical Manufacturer's Association. Such testing shall be performed in the manufacturer's shop and all discrepancies and errors of any nature shall be corrected prior to delivery to the Site. Submit certified copies of test results.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The equipment shall be leveled and anchored directly to a foundation. Provide hardware and metal shims for installation. Grout and caulk all voids beneath the equipment base. Anchor bolts shall be sized and installed in accordance with the submitted seismic calculations. Doors shall close easily and completely without interference to or from adjacent sections, and all latches shall close securely without being forced.

B. All components of the Motor Control Center shall be installed as indicated on the Drawings in accordance with the latest edition of the National Electrical Code and the applicable rules of the State of California Basic Electrical Regulations Title 24, Part 3, 1987, including the latest revisions and in accordance with the manufacturer's instructions.

C. Make wiring interconnections between shipping splits. Install bus splice plates and torque the connections.

D. Touch-up damaged paint finishes.

3.02 FIELD TESTING AND SERVICES

A. Manufacturer's installation and commissioning representatives specifically trained in the installation of the equipment shall be furnished to supervise the
installation and make adjustments, repairs, corrections, and perform fine-tuning, startup, testing, and final adjustment tasks of the equipment furnished.

B. Field testing shall be performed in the presence of the City’s representative and per the requirements of Section 16 96 00 and as supplemented herein. Field testing procedures shall duplicate as nearly as possible the conditions of operation and shall be selected to demonstrate that the equipment is operational and free from damage. Field testing procedures shall demonstrate that the equipment has been properly serviced, aligned, connected, calibrated, and adjusted prior to operation.

C. Prepare and submit reports for all tests in accordance with Section 16 96 00.

3.03 CLEANING

Remove all rubbish and debris from inside and around the MCC. Remove dirt, dust, adhesives, tapes, stickers, or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner, or clean, lint-free rags. Do not use compressed air.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor required complete grounding work as indicated on the Drawings, as specified herein, as specified in other Sections of the Specifications, and as required to provide grounding for applicable equipment and systems.

1.02 RELATED WORK SPECIFIED ELSEWHERE

Section. Other Division and Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. Division 15 Mechanical, applicable sections

3. Division 16 Electrical, applicable sections

with raceway and electrical conductors furnished, installed, and connected under Division 16, Electrical.

1.03 REFERENCED SPECIFICATIONS, CODES AND STANDARDS

requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.

NEC National Electrical Code

CEC California Electrical Code
California Code of Regulations - Title 8, Industrial Relations, Subchapter 5, Electrical Safety Orders.

ANSI/UL 467 - Safety Standard for Grounding and Bonding Equipment

IEEE 142 - Grounding of Industrial and Commercial Power Systems

comply with all applicable provisions of the CAL OSHA Safety orders. (Title 8 CCR, as applicable), State Building Standards, and applicable local codes and regulations.

1.04 SUBMITTALS

32 19 and 16 00 00.

PART 2 - PRODUCTS

2.01 GROUND CONDUCTORS, ROD AND MISCELLANEOUS MATERIAL

A. For Switchboard, MCC and standby generator to ground well use #2/0 thinned bare copper wire for grounding.

B. All raceways, conduits and ducts shall contain equipment-grounding conductors sized in accordance with the NEC. Minimum sizes shall be No. 12 AWG.

C. Grounding conductor size shall be as shown on the Drawings. In no case it shall be less than that stipulated by the NEC for that specific application.

D. Ground rods shall be 3/4-inch by 10-feet copper clad steel and constructed in accordance with UL 467. The minimum copper thickness shall be 0.25 mm. Ground rods shall be Copperweld or equal.
E. Unless otherwise more stringent requirements are noted, provide grounding material for all equipment and devices per manufacturer’s instructions and recommendations.

F. Grounding conduit hubs shall be malleable iron type, and of the correct size for the conduit, as manufactured by Thomas & Betts Co. (Catalog No. 3940 Series), similar by Burndy, O.Z. Gedney Co., or equal.

G. All grounding conductors furnished shall be composed of material resistant to any existing corrosive conditions or shall be suitably protected against such conditions.

H. Ground well shall be made of precast concrete with galvanized steel cover. Size shall be as shown on the Drawings, but it shall not be less than 11” x 17” x 12” deep. Ground well shall be rated for parkway loading if it is to be installed in untraveled area. If it is to be installed in vehicular traveled area, it shall be H-20 traffic rated. The well shall be supported on 6” thick minimum gravel or Caltrans Class II base.

2.02 GROUND CONNECTIONS

A. For below grade connections, provide exothermic-welded connectors.

B. For above grade connections, provide bolted connectors.

PART 3 - EXECUTION

3.01 GENERAL

A. Except where specifically indicated otherwise, ground all exposed noncurrent-carrying metallic parts of electrical equipment, raceway systems, devices, and the neutral of all wiring systems in strict accordance with the state, and other applicable laws and regulations and as recommended by the manufacturer.

B. Use the following three paragraphs wherever it is decided to run individual equipment grounding wires, rather than rely on raceways as return paths for fault current. Such a grounding wire should be included on all medium voltage circuits.

C. Where grounding conductors are shown, bond the wires to metallic enclosures at each end and to all intermediate metallic enclosures. Connect grounding conductors to all grounding bushings on raceways. Where any equipment contains a ground bus, extend and connect grounding conductors to that bus. Connect the enclosure of the equipment containing the ground bus to that bus. Run ground conductors inside conduits enclosing the power conductors.
D. Ground connection to equipment and ground buses shall be by copper ground lugs or clamps. Connections to enclosures not provided with ground buses or ground terminals shall be by clamp type lugs added under permanent assembly bolts or under new bolts drilled and added through enclosures other than explosion proof, or by grounding locknuts or bushings. Explosion proof enclosures not provided with any of the above grounding means shall be grounded by the addition of an adjacent junction box with a ground lug. Ground cable connections to anchor bolts, against gaskets, paint, or varnish, or on bolts holding removable access covers will not be permitted.

E. Care shall be taken to ensure good ground continuity, in particular between the conduit system and equipment frames and enclosures. Where there is no continuity between two components, jumper wires shall be installed.

F. Ground shields of any shielded power cable at each splice or termination in accordance with recommendations of the splice or termination manufacturer.

G. Ground metal sheathing and any exposed metal vertical structural elements of buildings. Ground metal fences enclosing electrical equipment. Bond any metal equipment platforms which support electrical equipment to that equipment. Provide good electrical contact between metal frames and railings supporting pushbutton stations, receptacles, instrument cabinets, etc., and raceways carrying circuits to these devices.

H. Bond neutrals of transformers within buildings to the system ground network, or to any additional indicated grounding electrodes.

I. Ground cable penetrations through building exterior walls shall enter within 3 feet below finish grade and shall be prepared with a water stop. Unless otherwise indicated, the water stop shall include filling the space between the strands with solder and soldering a 12 inch copper disc over the cable.

J. Ground cable near the base of a structure shall be in earth and as far from the structure as the excavation permits but not closer than 6 inches.

K. The main grounding conductor when exposed within a building shall be copper bar supported with suitable spacers at ½ to one inch from the structure. Unless otherwise indicated on the drawings, the ground bus shall not be smaller than 1/4 by one inch rectangular.

L. Ground conductors on equipment shall be formed to the contour of the equipment and firmly supported.

M. All ground connection hardware, bolts, and nuts shall be high strength, high conductivity copper alloy.
N. Ground cables with encased underground conduit banks shall be as indicated on the drawings.
O. Ground cables in underground circuits shall be bonded with main ground cables in each maintenance hole and handhold. Maintenance hole hardware and cover shall be effectively grounded.

P. Liquid tight flexible conduits shall be provided with separate equipment grounding conductors sized in accordance with the NEC. The equipment grounding conductor shall be bonded to an approved grounding bushing and terminal lug. The grounding conductor can be installed outside the conduit if the required size is greater than No. 10.

Q. Exposed splices and connections for bare copper conductors and buses shall be protected by wrapping with heat shrink tape or covering.

R. All grounding type receptacles shall be grounded to the outlet boxes with a No. 12 THW green conductor connected to the ground terminal of the receptacle and fastened to the outlet box by means of a grounding screw.

3.02 GROUNDING CONNECTIONS

rods at the upper end of the rod with the end of the rod and the connection point below finished grade.

Make connections of other grounding conductors generally accessible.

metal surface. Use exothermic welding cartridges and molds in accordance with the manufacturer's recommendations. After welds have been made and cooled, brush slag from the weld area and thoroughly clean the joint.

connector manufacturer's compression tool. Notify the City prior to backfilling any ground connections.

3.03 FIELD INSPECTION AND TESTING

A. Inspect the grounding and bonding system conductors and connections for tightness and proper installation.

B. Test each enclosure as well as metal parts associated with electrical equipment for continuity of connection back to the grounding electrode.

C. Use Biddle Direct Reading Earth Resistance Tester or equivalent test instrument to measure resistance to ground of the system. Perform testing in accordance
with test instrument manufacturer’s recommendations using the fall-of-potential method.

D. All test equipment shall be provided under this Section and approved by the City. Documentation of satisfactory meter calibration shall be available for verification by the City.

E. Resistance to ground testing shall be performed during dry season and shall not exceed 5 ohms. Submit test results in the form of a graph showing the number of points measured (12 minimum) and the numerical resistance to ground.

F. All exothermic ground connections shall be inspected by the City before being covered or concealed.

G. Mechanically questionable or compromised welds shall be removed and re-terminated at the sole discretion of the City.

H. Testing shall be performed as required by this Section and Section 16 96 00 before energizing the distribution system. All testing shall be performed in the presence of the City’s representative. A separate test shall be conducted for each building or system.

END OF SECTION
SECTION 16 70 50

STANDBY DIESEL ENGINE POWER GENERATOR SET – 480 VAC

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required, to furnish, deliver, and install one diesel engine power generator unit to provide 480 VAC standby power for La Granada Pump Station facility in case of utility power outage, as specified herein, and as shown on the Drawings.

B. The unit shall be complete and include, but is not limited to, engine, generator, alternator, control system, batteries, battery racks, battery chargers, block heater, particulate filters, grounding system, engine exhaust silencer and piping system, radiator exhaust system, insulation for exhaust piping system, supports with seismic and vibration controls for engine, generator, exhaust piping, silencer and other components, and other required accessories and auxiliaries.

C. The unit shall also include a complete sound attenuating enclosure of type specified herein with all required accessories and appurtenances for complete installation.

D. The unit shall include diesel storage tank (installed below generator unit) and associated support frames, anchors, piping, vents, emergency vents, enclosure caps, tubing, pumps, valves, signals, alarms, complete as shown on the drawings, as specified herein and as required to complete the work.

E. Furnish and install all necessary appurtenant equipment, accessories, and auxiliaries, whether specifically mentioned in Contract Documents or not, to make the system, including standby engine generator unit, sound enclosure, and diesel storage tank systems complete, operational, and conforming to the requirements of applicable codes.

F. The engine generator units shall be prototype tested, factory built, factory tested and field tested.

G. Provide coordination, guidance, and support services for all appurtenances and equipment attached to the diesel engine generator unit to ensure proper operation of the diesel engine generators.

H. Contractor to obtain permits and deliver to the City.
1.02 RELATED WORK

A. Manufacturer’s Field Services are included in Section 01 64 00.

B. Facility Startup is included in Section 01 75 00.

C. Concrete Work is included in Section 03 30 00.

D. Metal Work - General Provisions are included in Section 05 50 00.

E. Electrical work is included under Division 16.

F. Power system and coordination studies as specified in Section 16 96 10.

1.03 SUBMITTALS

Submit to the Engineer, in accordance with Sections 01 32 19, shop drawings and product data for the following:

A. Generator System

1. Master index.

2. Design calculations for required rating of generator system based on the specified load.

3. Drawings showing plan, elevations and details with dimensions for engine-generator unit and all major components.

4. Top view indicating locations of instrumentation, sensors, control panels, junction boxes, and fuel line connections, etc.

5. Engine data, including engine performance data, heat rejection, exhaust gas flows, combustion air and ventilation airflows, fuel consumption, etc.

6. Generator data including temperature and insulation data, cooling requirements, excitation ratings, voltage regulation, voltage regulator, efficiencies, waveform distortion and telephone influence factor.

7. Generator resistances, reactance and time constants.

8. Generator locked rotor motor starting curves.

9. Manufacturer’s documentation showing maximum expected transient voltage and frequency dips, and recovery time during operation of the generator set at the specified site conditions with the specified loads.
10. Wiring diagrams and interconnection diagrams identifying each interconnection by terminal number. These shall include power, signal, and control wiring.

11. Weights of all major components.

12. Drawings and detailed data sheets of all standard and optional accessories to be supplied with the units.

13. Drawings and detailed data sheets of all appurtenances, auxiliaries, and accessories to be furnished.

14. Certified prototype test reports.

15. Calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases. Calculations and details for support and anchoring system for the entire diesel generator unit. This shall include details, material data, and sizes for steel frames, seismic isolators, and anchors. Calculations shall be signed and sealed by a qualified engineer.

16. Drawings, details, technical information, and installation details for the components of the engine exhaust system. These shall include silencer, piping, fittings, flexible pipe joints, vibration isolators, supports, thimble, drains, cap, insulation material, anchors, and all other required accessories.

17. Drawings, details, technical information, and installation details for the components of the radiator air discharge system.

18. Drawings and detailed data sheets of all appurtenances, auxiliaries, and accessories not listed above, but required to be furnished.

19. Operation and Maintenance Data: Provide a complete operation and maintenance manual for the system and its components. Additionally, include the following.

   a. List of tools and replacement items recommended to be stored at the project for ready access.
   
   b. List of part and drawing numbers, current prices, and source of supply.

20. Quality-Control Test Reports:

   a. Certified summary of prototype-unit test report.
b. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.


d. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.

e. Report of sound generation.

f. Report of exhaust emissions showing compliance with applicable regulations.

g. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

h. Detailed field test procedures, setup, and reports.

B. Sound Attenuating Enclosure System:

1. Scaled drawings showing layout plans and elevations of the enclosure and all its major components with dimensions.

2. Material and technical data, for all items to be furnished, including appurtenances and auxiliary items.

3. Sound attenuating material data. Sound attenuation data and test reports for prototype unit.

4. Fabrication details.

5. Painting and coating data.

6. Color chart for City’s selection.

7. Certification stating that the enclosure meets the requirements of UL2200, this Section, and other applicable codes and regulations.

C. Diesel Storage Tank System:

1. Scaled drawings showing layout plans and elevations of the fuel tank and all its major components with dimensions.

2. Storage capacity.
3. Material and technical data, for all items to be furnished, including appurtenances and auxiliary items.

4. Fabrication details.

5. Supports and anchors.

6. Piping, valves, flexible tubing, connectors, and like items.

7. Location and sizes of all piping, vents, openings, caps, tubing, pumps, and valves.

8. Painting and coating data. Color shall be black or as approved by the City.

9. Certification stating that the fuel tank is UL142 listed and meets requirements of NFPA 30, this Section, and other applicable codes and regulations.

D. Painting and coating data for each major component.

E. Concrete foundation design calculations including required minimum size and reinforcement. The minimum requirements are shown on the Drawings. The contractor shall provide bigger foundation if required by the calculations.

F. Training session schedules and materials.

G. Submit documents showing that the engine is EPA/California Air Resources Board (CARB) certified Tier 3 engine.

H. Operation and maintenance manuals for all items to be furnished under this Section.

I. Obtain and submit permits from Ventura County Air Pollution Control District (VCAPCD) for the generator system and its components, including fuel storage tank.

J. The Contractor shall obtain and submit to the City any other permits that are required by applicable laws and regulations.

1.04 REFERENCE STANDARDS

A. The engine generator set shall be designed, built and tested in accordance with the latest revisions of the following standards as applicable.

1. CSA C22.2 No. 14, Industrial Control Equipment
2. EN50082-2, Electromagnetic Compatibility-Generic Immunity - Part 2, Industrial Environment

3. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment

4. IEC8528 Part 4, Control Systems for Generator Sets

5. IEC Std. 61000-2 and 61000-3 for susceptibility, 61000-6 radiated and conducted electromagnetic emissions

6. IEEE446 Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications

7. NEMA MG 1 - Standard for Motors and Generators

8. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

9. NEMA AB 1 - Molded Case Circuit Breakers

10. NFPA 30 - Flammable and Combustible Liquids

11. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines


13. NFPA 110 - Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems and Level 1 prototype tests transferring scheme and the remote annunciator panel if included elsewhere in these Specifications.

14. NFPA 272 - Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables

15. UL 508 - Industrial Control Equipment

16. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries

17. UL 2200 - Stationary Engine Generator Assemblies
B. California Air Resources Board (CARB)

C. Ventura County Air Pollution Control District (VCAPCD)

D. South Coast Air Quality Management District (SCAQMD)

E. Environmental Protection Agency (EPA)

**1.05 QUALITY ASSURANCE AND QUALIFICATIONS**

A. The equipment shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years.

B. The generator system shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.

C. The standby power system, including generator unit, sound enclosure, diesel storage tank, and associated accessories and appurtenances shall be furnished through one source from a single manufacturer who shall be responsible for the design, coordination, installation, and testing of the complete system.

D. The generator set shall be IBC Certified meeting the required maximum seismic design acceleration level per the International Building Code for the Site.

E. Generator system installers shall be manufacturer’s authorized representatives who is trained and approved for installation of the specified systems.

F. Generator System Testing Agency Qualifications:

1. An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the National Electrical Testing Association or is a nationally recognized testing laboratory (NRTL), and that is acceptable to authorities having jurisdiction.

2. Testing Agency’s Field Supervisor shall be currently certified by the National Electrical Testing Association (NETA) or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in these Specifications.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
H. Manufacturer(s) shall provide field services and facility start-up services in accordance with the requirements of the Contract Documents, including this Section, Section 01 64 00, and Section 01 75 00.

1.06 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions.

B. Shipping groups shall be designed for shipment by truck, rail, or ship. Indoor groups shall be bolted to skids. Accessories shall be packaged and shipped separately.

C. The engine/generator skid shall be suitable for moving in place on rollers or similar device.

D. Prior to installation, the engine/generator unit shall be stored to maintain the equipment in a clean and dry condition. If stored outdoors, the unit shall be covered and heated to avoid condensation.

E. Existing site condition shall be field verified to develop proper procedure for delivery, storage, handling and placement of equipment.

1.07 COORDINATION

Coordinate with all associated work of other trades and divisions, including but not limited to, concrete, electrical, mechanical, etc.

1.08 PROJECT CONDITION

A. All material and equipment to be furnished shall be suitable and designed for the project site condition.

B. The following shall be considered in the design and installation of all material and equipment.

   1. Minimum Ambient Temperature: 20 °F
   2. Maximum Ambient Temperature: 108 °F
   3. Relative Humidity: 0 - 95 percent
   4. Altitude: 1060 feet above mean sea level
1.09 WARRANTY & MAINTENANCE

A. Two-year warranty for the generator set shall be included to guarantee against defective material and workmanship in accordance with the manufacturer’s published warranty from date of start-up. The Contractor shall submit all warranty documents to the City.

B. The generator set manufacturer and its distributor shall maintain a parts and service organization. This organization shall be regularly engaged in a maintenance contract program to perform preventive maintenance and service on equipment similar to that specified.

C. A two-year maintenance and service shall be provided and shall include the tasks in accordance with Paragraph 3.07.

1.10 PERMITS

A. Contractor shall file and obtain permits from Ventura County Air Pollution Control District (VCAPCD) for the generator system and its components, including fuel storage tank. These shall include the following.

1. Before construction permits.
2. After construction permits.
3. Permits to Operate.

B. The Contractor shall obtain and submit to the City any other permits that are required by applicable laws and regulations.

C. Contractor shall pay for all initial permit fees for permits listed in 1.10.A and 1.10.B.

D. Permit documents and proof of payments shall be delivered to the City prior to facility start-up.

PART 2 - PRODUCTS

2.01 ENGINE–GENERATOR SET MANUFACTURERS

A. MTU Onsite Energy (contact Tony Miccolis at (310) 245-0292 or tony.miccolis@collicutt.com)
B. Or approved equal. Any changes to the generator set installation requirements due to manufacturers’ products differing from the Basis-of-Design Product are the responsibility of the Contractor.

2.02 ENGINE–GENERATOR SET RATING

A. The engine-generator set shall be factory-assembled and -tested packaged system.

B. The generator output voltages shall be 480 volts, 3 phase, 12w, 60 hertz.

C. The minimum rating shall be 400 kW, 500 kVA, 600 Amps and shall be capable to operate the load as specified below and as shown on the Drawings.

1. Load Scenario 1:
   a. One electric fire pump, with 300HP, 480VAC motor (with soft starter)
   b. 25kVA 480-120/240 VAC transformer.

2. Load Scenario 2:
   a. Two regular electric pumps, with 50HP, 480VAC motor, each (with soft starter).
   b. 25kVA 480-120/240 VAC transformer.

D. The equipment shall be rated such that it is suitable to the electrical switchboard and ATS specified for this project.

E. Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying sufficient LRKVA for starting motor loads with a maximum instantaneous voltage dip of 30% as measured by a digital RMS transient recorded in accordance with IEEE Standard 115. Motor starting performance and voltage dip determination that does not account for all components affecting total voltage dip, i.e. engine, alternator, voltage regulator and governor will not be acceptable. As such, the generator set shall be prototype tested to optimize and determine performance as a generator set system.

F. The unit shall be EPA Tier 3 certified.

G. The unit shall be UL listed.

H. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.
I. Generator-Set Performance with Shunt Excitation:

1. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.

2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three to four seconds.

3. Steady-State Frequency Operational Bandwidth: 0.25 percent of rated frequency from no load to full load.

4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.

6. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.03 ENGINE

A. Basic Engine Features: Grey cast-iron crankcase, Flywheel housing SAE 1, Flywheel 14”, Oil pan, Forged crankshaft, forged connecting rods, Four-valve overhead camshaft, Light-metal solid-skirt pistons, Piston cooling via oil spray nozzle, Dry exhaust manifold and vibration damper.

B. The engine shall deliver a minimum of 400 kW at a governed engine speed of 1800 rpm, and shall be equipped with the following:

1. Electronic isochronous governor capable of 0.25% steady-state frequency regulation.

2. 24-volt positive-engagement solenoid shift-starting motor (starter).

3. Fuel System: Common rail fuel injection with low and high pressure fuel pumps, electronically controlled injection, main filter, and pre-filter.

4. 60-ampere minimum automatic battery charging alternator with a solid-state voltage regulator.
5. Lube Oil System: Forced-feed lubrication system with piston cooling, lube oil circulating pump with safety valve, lube oil filter, lube oil heat exchanger, filler neck, dip stick and closed crankcase breather system.

C. Cooling System: Coolant system shall include coolant circulation pump, engine mounted fan drive and pusher fan.

D. Combustion Air System: The system shall include exhaust turbo chargers, intercooler integrated in radiator, set of dry type air filters with contamination indicator and air intake pipe work.

E. The engine shall comply with the state emissions regulations at the time of installation/commissioning.

F. The engine and appurtenances shall meet all requirements necessary to obtain local air quality management district permits to construct and operate.

2.04 ENGINE FUEL SYSTEM

A. The fuel system shall be integral with the engine. Main fuel pump shall be mounted on engine. The pump shall ensure adequate primary fuel flow under starting and all load conditions.

B. Relief-Bypass valve shall be provided to automatically regulate pressure in fuel line and returns excess fuel to the source.

C. Lift pump shall be installed to provide adequate pressure to the main fuel pump mounted on the engine.

D. Fuel Water Separator: Single canister fuel water separator rated to remove a minimum of 30 microns and smaller while passing full flow shall be provided.

E. All fuel piping shall be black iron or flexible fuel hose rated for this service. No galvanized piping will be permitted. Flexible fuel lines shall be minimally rated for 300 degrees F and 100 psi.

2.05 ENGINE COOLING SYSTEM

A. Closed loop, liquid cooled, cooling system with radiator and integral engine-driven coolant pump shall be provided on engine-generator set mounting frame and shall be mounted in factory. The system shall include the following.

1. Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Adequately sized radiator to contain expansion of total system coolant from cold start to 110 percent of load condition.

3. Expansion tank constructed to withstand maximum closed-loop coolant system pressure for engine used.

4. Temperature control system with self-contained, thermostatic-control valve that modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber.
   a. Rating: 50-psig maximum working pressure with coolant at a temperature of 180°F (82°C), and non-collapsible under vacuum.
   b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

2.06 COOLANT JACKET HEATER:

An electric water heater with integral thermostatic control, properly sized to maintain engine jacket water at 90 degrees and suitable for operation in an ambient temperature of -20°F (-29°C). Comply with NFPA 110 requirements for Level 1 equipment for heater capacity. Block heater shall be 240V single phase.

2.07 LUBE OIL SYSTEM

Lube oil system shall be a complete forced-feed lubrication system with piston cooling. The system shall include lube oil circulating pump with safety valve, lube oil filter, lube oil heat exchanger, filler neck, dip stick and closed crankcase breather system.

2.08 STARTING SYSTEM:

A. Starting shall be 12 or 24 volt electric, with negative ground.

B. Components shall be sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in this Section.

C. Cranking motor shall be heavy-duty unit that automatically engages and releases from engine flywheel without binding. Cranking cycle shall be as required by NFPA 110 for system level specified.
D. Required number of batteries shall be provided with cables and support rack. The battery shall be sized to provide for at least three consecutive startups without necessity to recharge.

E. Battery cables shall be sized as recommended by the engine manufacturer for cable length required. Include required interconnecting conductors and connection accessories.

F. Battery rack shall be sized to accommodate required number and size of batteries.

G. Battery Charger: Battery charger shall be as follows and include the following features.

1. Unit shall comply with UL 1236.

2. Battery charger input shall be 120 VAC single phase and output shall be compatible to the batteries, 12 or 24VDC.

3. Operation: Minimum equalizing-charging rate of 10 amps shall be initiated automatically after battery has lost charge until and adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.

4. Automatic Temperature Compensation: Must be equipped with temperature compensation to assure correct charging in all conditions.

5. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 0.5 percent.

6. Ammeter and Voltmeter: Digital display shall indicate charging rates.

7. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of AC input or DC output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.


H. Unless otherwise approved, all components for the Staring System shall be installed within the sound attenuated enclosure.
2.09 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1. Temperature rise of the rotor and stator shall be limited to Standby 105° C. The ratings shall meet the NEMA standard MG1-32.40 temperature rise limits.

B. Generator shaft shall be directly connected to the engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical insulation shall be Class H or Class F.

D. Stator-winding leads shall be brought out to terminal box to permit future reconnection for other voltages if required.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Enclosure shall be drip proof.

G. Instrument transformers shall be mounted within generator enclosure.

H. The alternator shall have a single maintenance-free bearing designed for 40,000-hour B10 life.

I. The excitation system shall be of brushless construction controlled by a solid-state voltage regulator (automatic voltage regulator-AVR) capable of maintaining voltage within ±.25% at any constant load from 0% to 100% of rating.

J. Voltage Regulator: Analog voltage controller shall regulate voltage on 50 or 60 hertz brushless generators. The controllers shall include frequency compensation, over-excitation shutdown, solid-state buildup circuitry, and EMI filtering. Adjustment potentiometers shall be located on the terminals and components side of the controller. The AVR shall be capable of proper operation under severe nonlinear loads and provide individual adjustments for voltage range, stability and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating.

K. The waveform harmonic distortion shall not exceed 5% total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.

L. The alternator shall be inherently capable of sustaining at least 250% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.
2.10 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. The generator shall be provided with two circuit breakers as follows. One circuit breaker shall be dedicated for load bank testing.

1. Electronic-trip type.
2. 800 amp rating.
3. 100 percent rated.
5. Complying with UL 489.
6. Manufactured by Cutler-Hammer or approved equal.
7. Product Description: Enclosed, molded-case circuit breaker conforming to NEMA AB 1 and FS-W-C.
8. The circuit breaker shall include auxiliary contacts, shunt trip, alarm switch, and overcurrent protection for 3 phase and ground faults.
9. The short circuit ratings of the circuit breaker shall be higher than available short circuit current delivered by the generator.

B. Generator Protection: Microprocessor-based device shall continuously monitor the total kVA level of the generator output, annunciating conditions that may result in generator damage. Protective devices shall perform the following functions:

1. Initiates a generator overload pre-alarm when generator has operated at an overload equivalent to 105 percent of full-rated load for 5 seconds. Indication for this alarm shall be integrated with other generator set malfunction pre-alarms.

2. Indicates a generator overload alarm when generator has operated at an overload equivalent to 105 percent of full-rated load for 300 seconds. Indication for this alarm shall be integrated with other generator set malfunction alarms.
2.11 GENERATOR SET CONTROL AND MONITORING SYSTEM

A. Automatic Starting System Sequence of Operation:

1. When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches shall initiate starting and stopping of generator set.

2. When mode-selector switch is switched to the on position, the generator set shall start.

3. The off position of same switch shall initiate generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

B. Manual Starting System Sequence of Operation:

1. Switching on-off switch on the generator control panel to the on position shall start the generator set.

2. The off position of same switch shall initiate generator-set shutdown.

3. When generator set is running, specified system or equipment failures or derangements shall automatically shut down generator set and initiate alarms.

4. Operation of a remote emergency-stop switch shall also shut down generator set.

C. Configuration: Operating and safety indications, protective devices, basic system controls, engine gages, instrument transformers, generator disconnect switch or circuit breaker, and other indicated components shall be grouped in a combination control and power panel. Rigidly mounted to the generator set.

D. Digital Generator Controller

1. Generator controller unit shall be mounted on the generator with viewable access. Controller shall be MTU 3010 with two Ethernet connections minimum or approved equal.

2. Communication System/Features: Communications USB, RS485 using Modbus (Slave), SAE J1939 engine ECU capability and separate RS485 for
providing communications to a remote display panel for NFPA 110 indication, and Ethernet communication.

3. Generator Control Panel Protection Features:
   
a. KWH/KVARH meter

b. Engine Protection (Over speed, Battery Over/Under Voltage, Auxiliary Excitation and Speed/Frequency Mismatch)

c. Generator protection (Over/Under Voltage, Over/Under Frequency, Unbalanced Voltage, Dead Bus Detection, Overload, Reverse/Reduced Power, Definite Over Current and Time Over Current, Inverse Time Over Current, Measured Ground Fault, and Phase Rotation)

4. Agency Approvals: Controller shall conform to the following:
   
a. UL 508, Industrial Control Equipment – UL Recognized Component

b. CSA Std. C22.2 No. 14, Industrial Control Equipment – CSA Certified

c. NFPA 110, Standard for Emergency and Standby Power Systems

5. Environmental: Controller shall conform to the following
   
a. Temperature: Operating Range: -40° to 158°F), Storage: -40° to 185°F

b. Humidity: IEC 68-2-38

c. Salt Fog: ASTM B 17-73, IEC 68-2-11 (tested while operational)

d. Ingress Protection: IEC IP54 for front panel

e. Shock: 15 G in 3 perpendicular planes

f. Vibration:
   
   ▪ 5 to 29 to 5 Hz: 1.5 G peak for 5 min.
   ▪ 29 to 52 to 29 Hz: 0.036" DECS-A for 2.5 min.
   ▪ 52 to 500 to 52 Hz: 5 G peak for 7.5 min.

6. Engine Control: The following control shall be provided.
   
a. Cranking Control: Cycle or Continuous (Quantity and Duration Fully Programmable)
b. Engine Cool down

c. Successful Start Counter: Counts and records successful engine starts

d. Timers including, but not limited to:
   - Engine Cool down Timer
   - Engine Maintenance Timer
   - Pre-Alarm Time Delays for Weak/Low Battery Voltage
   - Alarm Time Delay for Over speed
   - Alarm Time Delay for Sender Failure.
   - Arming Time Delays after Crank Disconnect:
     o Low Oil Pressure
     o High Coolant Temperature

7. Alarms: The following alarm shall be provided.

   a. Low Oil Pressure
   
   b. High Coolant Temperature
   
   c. Low Coolant Level
   
   d. Low Fuel Level
   
   e. Over speed
   
   f. Over crank
   
   g. Engine Sender Unit Failure
   
   h. Fuel Leak/Fuel Sender Failure
   
   i. Emergency Stop
   
   j. Battery Charger Failure
   
   k. Critical Low Fuel Shutdown

8. Pre-Alarms: The following shall be provided.

   a. Low Oil Pressure
   
   b. High Coolant Temperature
   
   c. Low Coolant Temperature
d. Battery Overvoltage

e. Weak Battery

f. Battery Charger Failure

g. Engine Sender Unit Failure

h. Engine kW Overload (3 levels)

i. Maintenance Interval Timer

j. Low Coolant Level

k. Low Fuel Level

l. Fuel Leak Detect

m. High Fuel Level

9. Generator Protection ANSI Functions:

   a. Under voltage (27)

   b. Overvoltage (59)

   c. ANSI Codes Reverse Power (32)

   d. Over frequency (81O)

   e. Loss of Excitation (40Q)

   f. Under frequency (81U)

E. Indicating and Protective Devices and Controls: Provide as required by NFPA 110 for Level 1 system, and with the following accessories.

   1. 4-Relay: The 4-relay board shall include (4) 10 amp form C relays customizable for user defined functionality requirements. Standard outputs as follows:

      a. Engine Run

      b. Engine Fail
c. Minor Alarm

d. Spare (as determined by the City)

F. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

G. Connection to Data Link: A separate terminal block, factor wired to Form C dry contacts, for each alarm and status indication shall be reserved for connections for data-link transmission of indications to remote data terminals.

H. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.

   1. Overcrank Shutdown
   2. Coolant Low-temperature Alarm
   3. Control Switch Not in Auto Position
   4. Battery-charger Malfunction Alarm
   5. Battery Low-voltage Alarm

I. Common Remote Audible Alarm: Signal the occurrence of any event listed below without differentiating between event types. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset.

   1. Engine High-temperature Shutdown.
   2. Lube-oil, Low-pressure Shutdown.
   3. Overspeed Shutdown.
   5. Engine High-temperature Pre-alarm.
   6. Lube-oil, Low-pressure Pre-alarm.
   7. Fuel Tank, Low-fuel Level.
   8. Low Coolant Level.
J. Remote Alarm Annunciator: Designed for compliance with NFPA 110. LEDs labeled with proper alarm conditions identify each alarm as well as an audible signal for each alarm condition. Silencing switch in face of panel silences signal without altering visual indication. Cabinet and faceplate shall be surface- or flush-mounting type to suit field mounting conditions as determined by the manufacture and approved by the City.

LED indications shall be provided for the following:

1. Alarms:
   a. Low Coolant Level
   b. High Coolant Temperature
   c. Low Oil Pressure
   d. Overcrank
   e. Overspeed
   f. Emergency Stop Activated
   g. Fuel Leak
   h. Sender Failure

2. Pre-Alarms:
   a. High Coolant Temperature
   b. Low Coolant Temperature
   c. Low Oil Pressure
   d. Low Fuel Level
   e. Battery Overvoltage
   f. Weak Battery
   g. Battery charger Failure
3. Operational Status:
   a. Switch Not in Auto
   b. Display Panel On
   c. EPS Supplying Load

K. Manufacturer: Controller and monitoring unit shall be MTU 3010 with at least two Ethernet connections or approved equal. It shall be supplied by the manufacturer of the Generator unit.

L. Remote Emergency-Stop Switch:
   1. Remote emergency-stop switch shall be NEMA 3R.
   2. Provide pole mounted flush type remote emergency-stop switch with label. Provide required tubing, clamps, supports, and hardware for installation of the switch. Install 8” diameter x 2’-6” deep concrete foundation for pole/tubing.
   3. Push button shall be protected from accidental operation.

2.12 AUXILIARY EQUIPMENT AND SYSTEMS

A. Block Heater
   1. A block heater shall be provided and installed. The block heater shall be thermostatically controlled and sized to maintain manufacturer’s recommended engine coolant temperature to meet the startup requirements of NFPA 99 and NFPA 110, Level 1. Block heater shall be 240V single phase as shown on the Lighting Panel “A” Schedule.

B. Air Filter and Air Restriction Indicator. Air filter shall be removable. The air cleaner restriction indicator shall indicate the need for maintenance of the air cleaner.

C. Dry Contact Kits
   1. The 10 Dry Contact Kit shall provide normally open and normally closed, gold-plated, high current contacts in a form C configuration without need of interposing relays to activate warning devices and other customer-provided accessories allowing remote monitoring of the generator set. Typically, lamps, audible alarms, or other devices signal faults or status conditions.
D. Seismic Isolators

1. Seismic isolators shall be as recommended by the manufacturer and per the design calculations and IBC certification criteria.

E. Fuel Cooler System

1. The unit shall include a cooler system and associated appurtenances for cooling of the engine return fuel. Cooling system shall include a radiator mounted fuel oil cooler or similar approved device.

F. Engine Exhaust System

1. General:
   
   a. Engine exhaust system shall be complete. The system and components shall be sized to suit engine exhaust gas flow at full rated load.

   b. The system shall include, but is not limited to, exhaust adaptor, piping, silencer, flexible connectors, filter, supports for piping and silencer, insulation, condensate drain, rain cap, hardware, and associated accessories as required.

   c. All components shall be designed and sized in accordance with the engine exhaust requirements of the approved unit and as recommended by the diesel generator manufacturer.

   d. The entire system shall be installed within the sound attenuating enclosure, except as required by the governing agency.

2. Piping:
   
   a. Piping shall be of adequate capacity to handle the exhaust flow with allowable pressure drop (backpressure).

   b. Piping and fittings shall be made of ASTM A53 black Schedule 40 welded steel material. All joints shall be welded or flanged. Provide required fittings and long radius elbows.

3. Exhaust Silencer: Exhaust silencer shall have the following features.
   
   a. Silencer shall be rated for hospital application. The silencer shall reduce total engine exhaust noise by 25 dB(A) at 3 feet.

   b. Heavy duty steel construction
c. Exhaust silencer and flexible stainless steel fitting shall be furnished factory installed inside the sound attenuated enclosure.

4. Diesel Particulate Filter (DPF):
   a. The filter shall be diesel particulate type filters. Diesel particulate filters for the generator set shall be a CARB “verified Diesel Emission Control Strategy” as listed on the CARB web site at [www.arb.ca.gov](http://www.arb.ca.gov).
   
   b. Filter shall provide high pressure and soot alarms.
   
   c. Filter shall be mounted on top of the sound enclosure.

5. Insulation:
   a. All exhaust system components shall be insulated as required.
   
   b. Insulation shall be in accordance with applicable codes and regulations.
   
   c. Insulation material shall be rated for at least 1200 degree F.
   
   d. Insulation thickness shall be designed in accordance with the National Commercial and Industrial Standard by Midwest Insulation Contractors Association (MICA) and applicable codes. The surface temperature of insulation material shall not exceed 140 degree F.

6. Accessories: Provide and install required accessories and hardware to install a complete exhaust system.
   
   G. Generator skid end caps.
   
   H. Generator rodent guards.
   
   I. Vibration isolation devices.

2.13 GENERATOR GROUNDING

A. The generator shall represent a separate derived system in accordance with NEC classification.

B. The operator neutral shall have a provision for connection of grounding electrode conductor.

C. A properly sized bond wire shall be installed before the generator neutral and generator enclosure.
D. Provide and install required grounding devices, including wires and rods for a complete grounding system for the generator.

2.14 PAINTING AND COATING

All ferrous surfaces shall be shop coated with a complete coating system in accordance with Section 09 91 00.

2.15 DOUBLE WALL SECONDARY CONTAINMENT SUB-BASE TANK

A. A sub-base fuel tank used in conjunction with a diesel powered generator set shall be provided. It shall be suitable for aboveground diesel storage and meet structural integrity requirements for mounting generator set directly on top.

B. Tank shall be large enough to operate the generator set for a period of 24 hours at 100% of rated load.

C. Approximate minimum size of the tank shall be 222” long x 84” wide x 14” deep with 650-gallon storage capacity minimum. The tank shall be extended type and extend approximately 28” beyond the radiator end of the generator.

D. The sub-base fuel system shall be listed under UL 142, subsection entitled Special Purpose Tanks EFVT category, and shall bear their mark of UL approval according to their particular classification.

E. The tank shall be manufactured and intended to be installed in accordance with the Flammable and Combustible Liquids Code–NFPA 30, the Standard for Installation and Use of Stationary Combustible Engine and Gas Turbines–NFPA 37, and Emergency and Standby Power Systems–NFPA 110.

F. The tank shall meet all applicable local, state, and federal codes. All required accessories and appurtenances shall be installed to meet all applicable codes.

G. Construction and Features:

1. Primary and Secondary Tanks
   a. Primary and secondary containment tanks shall be constructed of welded steel to ensure required structural integrity.

   b. Tank system shall include integral lifting rings.

2. Steel Channel Support System
a. Reinforced steel box channel support system shall be adequately
designed and constructed to support anticipated loads. Full height
gussets at either end of channel and at generator set mounting holes
shall be utilized.

b. Provide required anchors to attach to concrete slab.

3. Protective Coating

a. Tank shall be coated with TGIC polyester powder paint or approved
equal. Unless otherwise approved, the color shall be black.

4. Fuel Lines

a. Fuel lines including supply, return, and others shall be provided as
required. Flexible fuel lines shall be provided to connect to the generator
set. All fuel lines shall be as recommended by the engine manufacturer
and in compliance with UL 2200 and NFPA requirements.

5. Normal Venting

a. Normal venting shall be sized in accordance with the American
Petroleum Institute Standard No 2000, Venting Atmospheric and Low
Pressure Storage Tanks. A mushroom cap shall be furnished and the
installing contractor shall pipe above the highest fill point as a minimum.

6. Emergency Venting

a. The emergency vent opening shall be sized to accommodate the total
capacity of both normal and emergency venting and shall be not less
than that derived from NFPA 30, Table 2-8, and based on the wetted
surface area of the tank. The wetted area of the tank shall be calculated
on the basis of 100 percent of the primary tank. A zinc plated
emergency pressure relief vent cap shall be furnished for the primary
tank. The vent shall be spring-pressure operated.

7. Fuel Fill

a. There shall be a 2" NPT opening within the primary tank with an 8"
raised fill pipe and lockable, vandal-resistant fill cap.

8. California Spill Package, to include the following:

a. 5 Gallon Spill Box

b. OFPY with Scully Fitting Cap
c. Alarm Panel

d. High / Low Fuel Level Switch

e. Fuel Leak Switch

f. Normal 12' Vent with Extension

g. Emergency Vent

9. Fuel Level Gauge and Indicator

a. A direct reading, UL listed, magnetic fuel level gauge with a hermetically-sealed vacuum tested dial shall be provided to eliminate fogging.

10. Fuel Level Switches

a. Provide high and low fuel level switches to indicate fuel level. Wire switches to generator control for local and remote indication of fuel level.

11. Leak detection provisions, wired to the generator set control for local and remote alarm indication.


2.16 SOUND ATTENUATED WEATHER ENCLOSURE

A. Sound attenuating, vandal-resistant, weatherproof, welded steel enclosure shall be provided for the generator system. The enclosure shall have the following features.

1. Designed in accordance with all applicable codes, including ASCE/SEI 7 for wind loads of up to 130 mph and seismic loads.

2. Enclosure shall be suitable for outdoor installation and constructed from suitable steel material.

3. Adequate access to components requiring maintenance.

4. Louvered and/or baffled air inlet. Grated air outlet.

5. Hinged doors with provisions for padlocking.

6. Space heater, which is thermostatically controlled and sized to prevent condensation.
7. Stainless steel hardware.

8. Exterior oil and coolant drains with interior valves for ease of service.

9. Polyester powder coated. Provide color chart for selection by the City.

10. Lifting brackets.

11. Lined with sound attenuating material.

12. Engine-Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 100 percent of rated load for five hours with ambient temperature at top of range specified in system service conditions.

13. Smoke detector mounted in enclosure conforming to NFPA 72.

B. Instruments, control, and exhaust silencer shall be mounted within the enclosure.

C. Sound Attenuation: The enclosure shall be constructed such that sound measured at 23.0 feet from sides of unit, sound attenuation shall be 76.5 dBA or less. Octave band sound report shall be provided based on similar unit construction.

D. Enclosure shall be UL2200 listed.

E. Enclosure shall be mounted directly to a sub-base fuel tank.

2.17 SPARE PARTS

A. For each engine generator furnish the following:

   1. One lubricating oil filter
   2. One primary fuel oil filter
   3. One secondary fuel oil filter
   4. One intake air filter

B. For each battery charger furnish the following:

   1. Two complete sets of fuses
C. All spare parts shall be properly packaged and labeled with detail identification and descriptions. All spare part packages shall be delivered to the City’s Maintenance Service Center at 1993 Rancho Conejo Boulevard, Newbury Park, CA 91320.

2.18 FACTORY TESTING OF STANDBY GENERATOR SET

A. Prototype Tests:

1. Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

2. Comply with NFPA 110, Level 1 Energy Converters and with IEEE 11.

3. Tests shall include the following:

   a. Maximum power (kW).

   b. Maximum motor starting (kVA) at 25% and 35% instantaneous voltage dips.

   c. Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.40.

   d. Governor speed regulation under steady-state and transient conditions.

   e. Voltage regulation and generator transient response.

   f. Harmonic analysis, voltage waveform deviation, and telephone influence factor.

   g. Three-phase short circuit tests.

   h. Alternator cooling air flow.

   i. Torsional analysis to verify that the generator set is free of harmful torsional stresses.

   j. Endurance testing.

4. Provide test reports to Engineer for acceptance.
B. Final Production Tests:

1. Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

   a. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.

   b. Full Load Run.

   c. Maximum Power.

   d. Voltage Regulation.

   e. Transient and Steady-State Governing.

   f. Single-Step Load Pickup.

   g. Safety Shutdown.

   h. Rated Power @ 0.8 PF.

2. Provide 14 days' advance written notice of tests and opportunity for observation of tests by the City's representatives.

3. Submit certified factory test results to the Engineer within 10 days of completion of final production tests.

PART 3 - EXECUTION

3.01 GENERAL

A. The diesel generator set and installation shall meet the requirements of the National Electrical Code and all regulations of the federal, state, and local authorities, including Ventura County Air Pollution Control District (VCAPCD).

B. Installation of all components shall be performed in accordance with the manufacturer's written instructions, the Contract Documents, and applicable codes and industry standards.

C. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.
D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

E. The Contractor and generator set installer shall field verify the existing site condition and configuration prior to delivery and installation of the equipment and develop delivery and installation plan accordingly.

F. Obtain and submit all permits to the City per Paragraph 1.10.

3.02 GENERATOR SET INSTALLATION

A. Install concrete base (foundation) for the generator unit. The minimum size of the concrete foundation shall be as shown on the Drawings or larger if required by the calculations.

B. Engine generator set, including sub-base fuel tank shall be adequately anchored to the concrete foundation and braced to withstand wind and seismic forces.

C. Install generator set, sub-base fuel tank, and sound enclosure.

D. Install all required fuel lines. Connect fuel piping to engines with a gate valve and union and flexible connector.

E. All connections between the engine generator and exterior systems, such as fuel lines, electrical connections, exhaust system, and air exhaust shall be flexible.

F. Install all auxiliary equipment and systems specified herein and as required to provide a complete generator set.

G. Install complete grounding system.

H. Install electrical conduits and wires.

I. Install communication conduits and wires.

J. Install controller.

3.03 FIELD PAINTING AND COATING

All damaged painting and coating shall be repaired per Section 09 92 00.
3.04 FIELD TESTS AND ADJUSTMENTS

A. Manufacturer's installation and commissioning representatives specifically trained in the installation of the equipment shall be furnished to supervise the installation and make adjustments, repairs, corrections, and perform fine-tuning, startup, testing, training, and final adjustment tasks of the equipment furnished. This shall include the final adjustments as required for all programmable features and calibration of instruments and meters. Each control device, item, or mechanical, electrical instrumentation equipment, and control circuits shall be considered in the testing procedures to demonstrate that the equipment has been properly serviced, aligned, connected, calibrated, and adjusted prior to operation.

B. The Contractor in coordination with the manufacturer’s representative shall perform an installation check, preliminary startup and operation test, and acceptance test.

C. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.

D. The City shall be notified about the scheduled field tests at least 10 Working Days in advance.

E. The Contractor shall provide all material, labor, and equipment to perform field tests.

F. The Contractor shall fill the fuel tank prior to start of any test.

G. Installation Check:

1. Perform general check for proper installation of the unit and its components.

2. Fuel, lubricating oil, and antifreeze shall be checked for conformance with the manufacturer's recommendations, under the environmental conditions present and expected.

3. Accessories that normally function while the test is standing by shall be checked prior to cranking the engine. These shall include block heaters, battery chargers, alternator strip heaters, remote annunciators, and other auxiliaries.

4. Confirm proper operations of all gauges, instruments, and switches.

5. Check exhaust system, including back pressure, leakage, and emission.
6. Perform satisfactory testing of electrical work required prior to energizing of the electrical and control systems.

7. Check noise level.

8. Simulate a power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. The generator set shall be started independently on simulated power outage. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.

H. Preliminary Startup and Testing

1. Perform generator set startup under test mode to check for exhaust leaks, path of exhaust gases, cooling airflow, movement during starting and stopping, vibration during operation, normal and emergency line-to-line voltage and frequency, phase rotation, etc.

I. Acceptance Tests

1. Fill fuel tank to maximum allowable level prior to start of the test.

2. Perform tests required by NFPA 110 that are additional to those specified herein.

3. One test shall be done using pump station load for two hours. Refer to Paragraph 2.02.C for the available pump station load. Fire pump and regular pumps cannot be operated simultaneously.

4. One test shall be done using load bank for two hours.

5. During each two our tests the following shall be monitored at intervals no greater than 15 minutes.
   - Power output in KW
   - Line to line voltage
   - Line currents
   - Power factor
   - Frequency
   - Engine coolant temperature
   - Engine oil pressure
   - Battery charge level
   - Ambient temperature

6. Perform tests, measurements, and record all required data (refer to Paragraph 3.04.I.5) to demonstrate the following:
a. Gen-set system operates satisfactorily.

b. Engine-generator unit speed regulation under a gradual change from zero to full load. Check governor speed setting.

c. Engine-generator unit voltage and frequency stability and transient responses.

d. Proper functioning of the overspeed trip.

e. Individual test of each pressure and temperature alarm switch, and all safety shutdowns.

f. Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Coordinate test for transfer switch and run it concurrently.

g. Proper operation of controls, engine shutdown, and safety devices.

h. Noise level is within acceptable limit with full load operation.

J. The Contractor shall provide all the required material and equipment, including diesel fuel for testing.

K. Perform required adjustments and repair as required. Remove and replace malfunctioning units and retest as specified above.

L. Submit reports for all field tests to the City.

M. The Contractor shall fill up the diesel storage tank after the testing is successfully completed.

3.05 REPAIR AND REPLACEMENT

A. Any work found to defective or unacceptable in accordance with the Contract Documents shall be repaired or replaced with new by the Contractor to the satisfaction of the City at no additional cost to the City.

B. If any existing facility is damaged due to Contractor’s operations, it shall be repaired or replaced to the satisfaction of the City.

3.06 TRAINING

Engage a factory-authorized service representative to train City’s maintenance personnel to adjust, operate, and maintain packaged engine generators.
Minimum of 4 hours of training shall be provided to City staff. Coordinate with the City for scheduling on-site training.

3.07 MAINTENANCE AND SERVICE

A. Manufacturer shall provide maintenance and service for two years. The maintenance and service shall include the following at a minimum.

1. Every 6th month following start-up and acceptance of the generator, a visual inspection shall be conducted along with topping off of coolant and oil (diesel fuel not to be included). Test/operate generator for 2 hours using load bank.

2. Adjust generator set and its components as required.

3. Submit reports to the City summarizing results of visual inspection, operation tests, and all adjustments made to the generator set and its components.

END OF SECTION
SECTION 16 80 00

AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish and install an automatic transfer switch for switching 480 VAC power source from SCE (utility) to standby generator in case of power outage and switching back to SCE power source when power is restored as shown on the Drawings, as specified herein, and as required to complete the work.

1.02 RELATED WORK

A. 480 Volt Switchboard is included in Section 16 50 00.
B. Motor Control Center is included in Section 16 60 00.
C. Standby Diesel Engine Power Generator Set – 480 VAC is included in Section 16 70 50.

1.03 REFERENCE STANDARDS

A. CSA C22.2 No. 178 Automatic Transfer Switches
B. IEC 60947-6-1 Low-Voltage Switchgear and Control Gear; Multiple Function Equipment; Transfer Switching Equipment
C. IEEE 446 IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
D. NFPA 70 National Electrical Code (Latest Edition)
E. NFPA 110 Emergency and Standby Power Systems
F. UL 508 Industrial Control Equipment
G. UL 1008 Transfer Switch Equipment
1.04 SUBMITTALS

A. Submit the following to the Engineer in accordance with Section 16 00 00:

1. Manufacturer’s catalog and detail technical data of all components of the automatic transfer switches (ATS). The submittal shall include, but shall not be limited to, the following:

   a. Fabrication details, including elevation and floor plan if needed

   b. Conduit entry details

   c. Component list

   d. Painting and coating data

B. Equipment support calculations, including seismic anchoring and anchor bolt sizing, as required by the manufacturer.

C. Manufacturer’s written certification of compliance with all specification requirements and to ISO 9001 standard in accordance with Paragraph 1.06.

D. Field test report.

1.05 QUALITY ASSURANCE

A. The automatic transfer switches shall be products of a manufacturer engaged in their manufacture for at least 5 years.

B. The manufacturer shall provide a letter certifying compliance with all of the requirements of this specification, including compliance with the above codes and standards. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.

C. The ATS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, and installation and servicing in accordance with ISO 9001.

1.06 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer’s instructions.
PART 2 - PRODUCTS

2.01 GENERAL SYSTEM DESCRIPTION AND REQUIREMENTS

A. Acceptable ATS manufacturers:
   1. Cutler-Hammer - Eaton
   2. Approved equal

B. The 480 VAC, 3 phase standby power system shall consist of 480 VAC, 400 kW standby generator.

C. Power to the 480 VAC switchboards, shall be supplied from the SCE transformer. The transformer represents “Normal” power supply.

D. In case of power outage at the 480 VAC bus the ATS shall start Standby Generator and, after the voltage and frequency produced by the generator are within the pre-set limits, shall transfer the load to the standby power source. The ATS shall transfer only when there is no power at the “Normal” side or the “Normal” power is not acceptable.

E. The standby Generator shall be shut down, after cooling down period, when there is no request for 480 VAC standby power from any of the ATS switches.

F. The ATS should consist of two 800A circuit breakers with adjustable trip and interlock. A switch should be available to turn both circuit breakers off when set in neutral.

2.02 RATING

A. The automatic transfer switch rating shall be as follows:
   1. The ATS shall be rated 480VAC, 3 pole, 800 amperes.

B. The short circuit ratings of the ATS switches shall be 100kA standard 3 cycle rating, 42kA standard 30 cycle rating.

2.03 CONSTRUCTION

A. Enclosure
   1. The ATS switches shall be provided with NEMA 1 enclosures with front access only, dead front.
2. The enclosures shall be wall mounted or free standing, depending on the manufacturer’s design.

3. Enclosures for the ATS switches shall conform to the dimensions shown on the Contract Drawings.

4. The enclosures shall be painted inside with a white enamel and outside with light grey #49 enamel.

5. Electrically operated, magnum stored energy mechanism, quick make/quick break, mechanically interlocked, integral overcurrent trip protection.

B. Mechanical Construction

1. The transfer switches shall be electrically operated and mechanically held, with double throw construction, and operated by a momentary energized, solenoid-driven mechanism.

2. All main contacts shall be silver composition. Switches rated 800 amperes and above shall have segmented, blow-on construction for high withstand and close-on capability and be protected by separate arcing contacts.

3. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. All stationary and moveable contacts shall be replaceable without removing power conductors and/or bus bars.

4. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources, are not acceptable.

C. Controller Display and Keypad

1. A four line, 20 character LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through the communications interface port. The following parameters shall only be adjustable via password-protected programming on the controller (dip switches shall not be acceptable):

   • Nominal line voltage and frequency
   • Single or three phase sensing
   • Operating parameter protection
Transfer operating mode configuration (Open transition, Closed transition, or Delayed transition)

D. Controller Voltage, Frequency, Phase Rotation and Fail Sensing

1. Voltage (all phases) and frequency on both the normal and emergency sources shall be continuously monitored, with the following pickup, dropout, and trip setting capabilities (values shown as % of nominal unless otherwise specified):

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dropout/Trip</th>
<th>Pickup/Reset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under voltage</td>
<td>75 to 98%</td>
<td>85 to 100%</td>
</tr>
<tr>
<td>Over voltage</td>
<td>105 to 135%</td>
<td>95 to 100% of trip</td>
</tr>
<tr>
<td>Under frequency</td>
<td>85 to 99%</td>
<td>95 to 99%</td>
</tr>
<tr>
<td>Over frequency</td>
<td>105 to 120%</td>
<td>101 to 105%</td>
</tr>
<tr>
<td>Voltage unbalance</td>
<td>5 to 20%</td>
<td>3% to 18%</td>
</tr>
</tbody>
</table>

2. Repetitive accuracy of all settings shall be within ± 0.5% over an operating temperature range of -20°C to 70°C.

3. Voltage and frequency settings shall be field adjustable in 1% increments using display and keypad.

4. The controller shall be capable of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or BAC). Unacceptable phase rotation shall be indicated on the display.

5. The controller shall be capable of detecting a single phasing condition of a source, even though a voltage may be regenerated by the load. This condition shall be considered a failed source.

6. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases (phase to phase and phase to neutral), frequency, and phase rotation.

E. Time Delays

1. An adjustable time delay of 0 to 10 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. Capability shall be provided to extend this time delay to 60 minutes by providing an external 24 VDC power supply.
2. A time delay shall be provided on transfer to the emergency source, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.

3. A time delay shall be provided on re-transfer to normal. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.

4. A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.

5. A time delay activated output signal shall also be provided to drive external relay(s) for selective load disconnect control. The controller shall be capable of controlling a maximum of 9 individual output time delays to step loads on after a transfer occurs. Each output may be individually programmed for their own time delay of up to 60 minutes. Each sequence shall be independently programmed for transferring from normal to emergency and transferring from emergency to normal.

The controller shall also include the following built-in time delays for the following operations:

- 0 to 60 minute time delay on failure to acquire the acceptable electrical parameters from the emergency source
- 0 to 60 minute time delay for a failure to synchronize on an in-phase operation
- 60 minute time delay for the load disconnect position for delayed transition operation

6. All time delays shall be adjustable in 1-second increments by using the display and keypad.

7. Each time delay shall be identified and a dynamic countdown shall be shown on the display.

F. Additional Features

1. The controller shall have 3 levels of security. Level 1 shall allow monitoring of settings and parameters only. Level 1 shall be capable of being restricted with the use of a lockable cover. Level 2 shall allow test functions to be performed and Level 3 shall allow setting of all parameters.

2. Membrane-type switches shall be provided for the test functions and be maintained until the end test function is activated. The test function shall be
allowed through password security. It shall be possible to defeat the password requirement by way of a circuit board mounted dip switch setting. The test function shall be load, no load or auto test. At the completion of this time delay, the test shall be automatically ended and a retransfer sequence shall commence.

All loaded tests shall be immediately ended and retransfer shall occur if the emergency source fails and the normal source is acceptable.

3. A SPDT contact, rated 5 amps at 30 VDC, shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.

4. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of two contacts, closed when the ATS is connected to the normal source and two contacts closed, when the ATS is connected to the emergency source.

5. LED indicating lights shall be provided, one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).

6. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal (green) and emergency sources (red), as determined by the voltage, frequency and phase rotation sensing trip and reset settings for each source.

7. An in-phase monitor shall be a standard feature in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The in-phase monitor shall be specifically designed for and be the product of the ATS manufacturer. The in-phase monitor shall be capable of being enabled or disabled for the user interface.

8. Engine Exerciser - The controller shall provide an internal engine exerciser. The engine exerciser shall allow the user to program up to 21 different exercise routines based on a calendar mode. For each routine, the user shall be able to:

   - Enable or disable the routine.
   - Enable or disable transfer of the load during routine.
- Set the start time:
  Time of day
  Day of week
  Week of month (1st, 2nd, 3rd, 4th, alternate or every)
- Set the duration of the run.
- At the end of the specified loaded exercise duration, the switch shall transfer the load back to normal and run the generator for the specified cool down period. All loaded exercises shall be immediately ended and retransfer shall occur if the standby source fails. The next exercise period shall be displayed on the main screen with the type of exercise, time and date. The type of exercise and the time remaining shall be display when the exercise is active. It shall be possible to end the exercise event with a single button push.

9. Date and Time

The date shall automatically adjust for leap year and the time shall have the capability of automatically adjusting for daylight savings and standard times.

10. System Status

The controller shall have the following default displays:
- System status
- Date, time and type of the next exercise event
- Average voltage of the preferred and standby sources

Scrolling through the displays shall indicate the following:
- Line to line and line to neutral voltages for both sources
- Frequency of each source
- Load current for each phase
- Single or three phase operation
- Type of transition
- Preferred source
- Commit or no commit modes of operation
- Source/source mode (Utility/Gen; Gen/Gen; Utility/Utility)
- In phase monitor enable/disable
- Phase rotation
- Date and time

11. Self Diagnostics - The controller shall contain a diagnostic screen for detecting system errors. This screen shall provide information on the status input signals to the controller that may be preventing load transfer commands from being completed.
12. Communications Interface - The controller shall be capable of interfacing, through a standard communications method with a network of transfer switches and generators. It shall be able to be connected via an RS-485 serial communication (up to 4000 ft. direct connect or multi-drop configuration), an Ethernet connectivity (over standard 10baseT Ethernet networks utilizing a RJ-45 port or remotely utilizing a dial-up modem). Monitoring software shall allow for the viewing, control and setup of parameters of the genset and transfer switch network through a standard personal computer utilizing Windows 7 Microsoft operating systems.

13. The transfer switch shall also be able to interface to 3rd party applications using Modbus RTU and Modbus TCP/IP open standard protocols utilizing Modbus register maps. Proprietary protocols shall not be acceptable.

14. The controller shall contain a USB port for downloading the controller's parameters and settings, exercise event schedules, maintenance records and event history. The file designator shall be the unique serial number of the transfer switch.

15. Data Logging - The controller shall have the ability to log data and to maintain the last 2000 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non-volatile memory. The controller shall be able to display up to the last 99 events. The remaining events shall be downloadable to be displayed on a computer.
   - Event Logging
     Data, date and time indication of any event

16. Statistical Data
   - Total number of transfers
   - Total number of fail to transfers
   - Total number of transfers due to preferred source failure
   - Total number of minutes of operation
   - Total number of minutes in the standby source
   - Total number of minutes not in the preferred source
   - Normal to emergency transfer time
   - Emergency to normal transfer time
   - System start date
   - Last maintenance date
   - The statistical data shall be held in two registers. One register shall contain data since start up and the second register shall contain data from the last maintenance reset.
PART 3 - EXECUTION

3.01 INSTALLATION

A. The ATS switches shall be installed at the locations identified on the Contract Drawings.

B. The conduit and wires to and from the switches shall be installed as indicated on the Contract Drawings and in the conduit and wiring schedules.

C. The ATS switches shall be installed in accordance with the manufacturer's requirements in regard to electrical and seismic conditions.

3.02 FIELD TESTING AND SERVICES

A. Manufacturer's installation and commissioning representatives specifically trained in the installation of the equipment shall be furnished to supervise the installation and make adjustments, repairs, corrections, and perform fine-tuning, startup, testing, and final adjustment tasks of the equipment furnished.

B. Field testing shall be performed in the presence of the City's representative and per the requirements of Sections 16 96 00 and as supplemented herein. Field testing procedures shall duplicate as nearly as possible the conditions of operation and shall be selected to demonstrate that the equipment is operational and free from damage.

C. The ATS switches shall be tested together with Standby Generator to prove that the entire 480 VAC standby system works properly. The testing shall be witnessed by the City. The Contractor shall inform the City at least 5 Working Days in advance of the test.

D. Prepare and submit reports for all tests in accordance with Section 16 96 00.

END OF SECTION
SECTION 16 90 00

CONTROL CABINET AND CONTROLS

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, material, equipment, incidentals, and services necessary to install control cabinet, controls, and associated components as shown on the Drawings, as specified herein, and as required to complete the work.

1.02 RELATED WORK

A. Electrical General Provisions are included in Section 16 00 00.
B. Wires and Cables (600 Volt Maximum) are included in Section 16 12 00.
C. Miscellaneous Electrical Material and Equipment are included in Section 16 19 10.
D. 480/277 Volt Switchboard is included in Section 16 50 00.
E. Motor Control Section is included in Section 16 60 00.
F. Instrumentation is included in Section 17 40 00.
G. Control Loop Descriptions are included in Section 17 41 00.
H. SCADA system is included in 17 50 00.

1.03 SUBMITALS

A. Submit to the Engineer, in accordance with Section 01 32 19, shop drawings and product data, for the following:

1. Equipment shop drawings showing elevation and plan views, compartment arrangement, dimensions and weight of the control cabinet.

2. Internal panel layouts indicating spacing and dimensions.

3. Cabinet front layouts.

4. Control schematics, ladder diagrams, and interconnection drawings.
5. Detailed technical data and catalog cuts for all instruments and devices to be furnished.

6. Anchor details.

7. Equipment support calculations, including seismic anchoring and anchor bolt sizing.

8. Painting and coating data

B. Submit factory test procedures.

C. Submit factory test results and reports.

D. Submit field test procedures.

E. Submit factory test results and reports.

F. Submit operating and maintenance manuals.

1.04 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions.

B. Equipment shall be equipped with lifting hooks/eye bolts for handling by crane. Where cranes are not available, equipment shall be suitable for skidding in place on rollers using jacks to raise and lower the groups.

C. Prior to installation, equipment shall be stored to maintain the equipment in a clean and dry condition.

PART 2 - PRODUCTS

2.01 CONTROL CABINET

A. The control cabinet shall have dimensions as indicated on the Drawings and shall be a structure matching adjacent MCC section.

B. The cabinet shall be freestanding NEMA Type 12 enclosure. The overall height of cabinet (excluding base channel) shall not exceed 90". The overall width of the cabinet shall not exceed dimensions indicated on the Drawings. Enclosure construction shall be minimum 14-gauge steel. Provide a permanent metal
data pocket attached to the inside of the enclosure.

C. Provide mounting panel for mounting of all interior components.

D. The paint color shall be #49 medium light gray per ANSI standard Z55.1-967 (60-70 gloss) on all surfaces, unless otherwise specified. Panel interior finish shall be white. The paint shall be applied using an electro-deposition process to ensure a uniform paint coat with high adhesion.

E. The control cabinet shall be provided with all necessary controls as shown on the Drawings and as described in these Specifications.

F. The desired elevations and locations of components at the control cabinet doors are shown in a general way on the Drawings. However, it is not intended that this arrangement be limiting in minor details. The pump station controls, including relays, programmable logic controller, modem, telephone termination panel, fuses and other incidentals shall be mounted at the control cabinet back panel.

G. In addition to the control equipment, the control cabinet shall be provided with the following devices.

1. Properly sized cooling fan package, including thermostatically controlled fan, an air filter, a finger guard and a grille.

2. Thermostat to control the fan.

3. Exhaust grille and filter.

4. Lighting package with door switch and 12 amperes, 120AC convenience outlet.

H. Terminal blocks shall be utilized to facilitate all external control conductor wiring as well as for convenience in connection and testing control conductors.

I. All cabinet control wiring shall be No. 14 unless otherwise noted. All analog signals shall be wired using 100% shielded cables.

J. All wiring in the control cabinet shall run in approved PVC wireways, Panduit or equal.

K. Control cabinet heater. The heater shall be controlled by a thermostat common for the motor control center and the control cabinet, provided by the switchboard and motor control center manufacturer.
2.02 PUSHBUTTONS

Pushbuttons shall be heavy-duty oiltight types having continuous rating of not less than 10 amperes at 120 volts. These pushbuttons shall be Allen-Bradley 800T Series. No substitutes.

2.03 SELECTOR SWITCHES

Selector switches shall be multi-light, oil tight types having continuous ratings of not less than 10 amperes at 120 volts. These switches shall be Allen-Bradley 800T Series. No substitutes.

2.04 AUXILIARY RELAYS

Auxiliary relays shall be plug-in type, multiple pole having a silver cadmium oxide (gold flashed) contacts for low level switching requirements of a minimum rating of 5A at 120VAC. The relays shall have the number of normally open and normally closed contacts as indicated on the wiring diagram, plus a minimum of one spare contact for each relay. The relays shall utilize mounting rails for mounting in the switchboard and shall be Square D, Class 8501, Type R or an approved equivalent.

2.05 TIMING RELAYS

Timing relays shall be knob adjustable with a dial calibrated in seconds, transient protected, with DPDT contacts of a minimum rating of 5 amperes at 120 volts AC. The relays shall utilize mounting rails for mounting in the switchboard and shall be Square D, Class 9050, type JCK or an approved equivalent.

2.06 WATER LEVEL RELAYS

Water level relays shall be solid state, plug-in type having minimum contact rating of 10 amperes at 120 volts. The number of normally open and normally closed contacts shall be as indicated on the drawings. The liquid level relays shall be as manufactured by Charles F. Warrick Company, Series 16M. No substitutes.

2.07 CONTROL POWER CIRCUIT BREAKERS

Control power circuit breaker to be installed in the control cabinet shall have contact rating of 15 to 20 amperes at 125 volts. The circuit breaker shall be thermal-magnetic circuit protector Altech Corp. C-Trip UL 508, Square D Class 9080, Type GCB, Cutler Hammer, or an approved equivalent.
2.08 PUMP STATION DISPLAY PANEL (PSDP)

The display panel shall provide for controlling and monitoring of pump station as described in Section 17 41 10 entitled "Control Loop Descriptions." The display panel shall be compatible with the Ignition Software. Specifications are as follows:

1. 15.6" Fanless Widescreen Panel PC with Intel Core i3-4010U, 8GB SO-DDR3-1600, Samsung SSD MZ-7KE, Windows 10 64 Bit English

2. Adapter for AC to DC voltage

3. Power Cord

4. Manufacturer: Advantech (No substitutes)

2.09 PUMP STATION REMOTE TERMINAL UNIT (RTU)/ PROGRAMMABLE LOGIC CONTROLLER

A. Processor shall have 1 MB RAM, capability of controlling up to 16 I/O modules, RAM memory backup through minimum two-year lithium battery and two Ethernet/IP and one USB communication ports. Processor shall be Allen-Bradley Model 1769-L33ER.

B. Communication Ports: Two separate Ethernet/IP and one USB ports.

C. Power Supply: Power supply for PLC shall have 120 VAC input and 5 VDC and 24 VDC output to the processor and I/O and communication slots. Power supply shall be rated 200VA at 120 VAC, Allen-Bradley 1769-PA4.

D. Digital input module shall have sixteen 24 VDC dry-contact inputs. Module shall be Allen-Bradley 1769-IQ16.

E. Digital output module shall have eight high-current Form C relay outputs. Module shall be Allen-Bradley 1769-0W8.

F. Analog input module shall have four 4-20mA inputs. Module shall be Allen-Bradley 1769-IF8.

G. Ethernet switch shall be Hirschmann (Belden) RS20 series with six 10/100 Base TX, RJ45 and two 100 Base FX single mode fiber.

H. End cap shall be Allen-Bradley 1769-ECR.
2.10 HUMAN MACHINE INTERFACE (HMI)

Human Machine Interface (HMI) shall be Ignition.

2.11 UNINTERRUPTIBLE POWER SUPPLY (UPS)

UPS shall be 120VAC, 1500VA, Allen-Bradley, 1609-D1500N with battery backup for at least 30 minutes.

2.12 NAMEPLATES

Nameplates shall be provided as indicated on the Drawings. Nameplates shall be as per Section 16 19 10.

2.13 TERMINAL BLOCKS

A. Terminal blocks shall be utilized to facilitate all external control conductor wiring as well as for convenience in connection and testing of internal control conductors. Terminal blocks shall have a minimum of 20% spare capacity, shall have no more than two wires per terminal, and shall be mounted on a 35 mm DIN rail. These terminals shall be Allen-Bradley 1492 series or equal. The terminal blocks shall be properly numbered in accordance with wiring diagrams using manufacturer’s standard method.

B. Fuse terminal blocks shall be utilized for protecting the process control loop equipment. The fuse terminal blocks shall be Allen-Bradley 1492 series or approved equal.

C. The terminal blocks shall be provided with all appurtenances, such as end plates, end clamps grounding blocks, marking labels, etc.

2.14 CONNECTION BETWEEN COMMUNICATION (FRONTIER) TERMINATION DEVICE AND PLC

A. The Contractor shall provide required coordination and field verification as required to determine required material, equipment and devices to make connection between PLC and Frontier termination device inside the Termination Cabinet. The material shall include, but not limited to the following as applicable:

a. An adapter for converting Frontier optical signal to an electrical as required. Adapter shall be compatible with the fiber cables installed by Frontier.

b. Wires between adapter and PLC.
PART 3 - EXECUTION

3.01 INSTALLATION

All control equipment, devices, and cabinet shall be installed in accordance with the requirements shown on the Drawings, applicable codes and regulations, and with the manufacturer’s installation instructions.

3.02 TESTING

A. All instrumentation equipment shall be calibrated as required in these specifications and as required by the manufacturer. Test reports of the calibration of the instrumentation shall be submitted to the Engineer.

B. Test control wires before terminating to any control device. The Contractor is responsible for any damage to components not isolated from the test voltage.

C. Perform point-to-point test for all instrumentation in presence of the City’s staff.

D. The Contractor shall assume responsibility for all adjustments and tests required prior to the pump station acceptance tests.

E. Provide copies of all test results to the City.

END OF SECTION
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SECTION 16 95 00

MODIFICATIONS TO EXISTING ELECTRICAL COMPONENTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This section covers general requirements of modifications to existing electrical and associated components.

B. Furnish all labor, materials, equipment and incidentals required to perform modifications to existing electrical and associated components as shown on the Drawings, as specified herein and as required to complete the work.

1.02 RELATED WORK

Modifications to other items are included on Drawings and other Sections of these Specifications.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide required materials to perform specified modifications and complete the work.

B. Provide materials in accordance with the applicable sections of the Specifications.

PART 3 - EXECUTION

3.01 GENERAL

A. Demolish items as shown on the Drawings.

B. All equipment and devices shall be fully functional after completion of modification and relocation work.

C. Install components in accordance with the applicable sections of these specifications and as shown on the Drawings.
D. Install components plumb, square and level and securely anchored to supports.

E. Install all required new material and components, including but not limited to, conduits, wires, boxes, junction boxes, pull boxes, clamps, supports, and hardware to complete the work.

F. Any existing components that are damaged by the Contractor's operations shall be replaced in kind.

G. Any paint material that is damaged by the Contractor's operations shall be repaired in accordance with Section 09 92 00.

3.02 RESERVOIR CATHODIC PROTECTION SYSTEM

A. The existing cathodic protection system cabinet is located adjacent to the existing La Granada Reservoir. The system shall be protected in place.

B. The existing reservoir cathodic protection system is powered from the existing 120/240 VAC power distribution panel. The system shall be powered from the new Lighting Panel “A” to be installed in the new motor control center (MCC) inside the new pump station building.

C. Install new conduits, wires, junction boxes, and other components as shown on the Drawings and as required to provide power to the existing cathodic system from the new Lighting Panel “A.” Remove and/or modify existing conduits, wires, and components as required and approved by the Engineer.

D. Remove existing cathodic system wires up to the reservoir roof top as required and install new in kind to provide a complete connected system.

E. Cathodic protection system shall be operated during entire construction period, except during electrical power switchover period. Existing system shall be powered by existing 120/240VAC or a temporary power system to be provided by the Contractor.

3.03 RESERVOIR WATER LEVEL TRANSMITTER

A. The existing La Granada Reservoir water level transmitter is located inside a cabinet adjacent to the existing La Granada Reservoir. The water level transmitter shall be protected in place.

B. The existing reservoir water level transmitter is currently wired to the existing RTU and radio system. The water level transmitter shall be wired to the new PLC to be installed in the new pump station control panel.
C. Install new conduits, wires, junction boxes, and other components as shown on the Drawings and as required to connect the existing transmitter to the new PLC. Remove and/or modify existing conduits, wires, and components as required and approved by the Engineer.

D. Existing water level transmitter shall be operated during entire construction period, except during electrical power switchover period. Existing transmitter shall be operated using existing 120/240VAC and PLC or a temporary power system and PLC to be provided by the Contractor.

3.04 SEISMIC VALVE SYSTEM

A. The existing two seismic valve cabinets, valve control cabinet (VCC), and valve power cabinet (VPC) are located inside a cabinet adjacent to the La Granada Reservoir near the front gate. VPC provides power to the seismic valve system. VCC includes a separate PLC for the seismic valve system for providing control.

B. The existing VCC shall be relocated inside the new pump station building as shown on the Drawings. Signals from VCC (PLC) shall be connected to the new pump station PLC inside the pump station control cabinet. VCC shall be powered (through VPC) from new Lighting Panel “A” to be installed in the new motor control center (MCC).

C. The existing VPC shall be relocated inside the new pump station building as shown on the Drawings. VPC shall be powered from the new Lighting Panel “A” to be installed in the new motor control center (MCC).

D. VCC and VPC shall be mounted on the building wall using stainless steel hardware and on galvanized uni-strut channels. Mounting height to the center of the cabinet shall be approximately 4 feet. Exact locations of the cabinets shall be determined in field as directed by the City.

E. Install new conduits and wires for VPC and VCC as shown on the Drawings and as required to complete the work. Install new conduits and wires for signals from VCC (PLC) to pump station PLC in the new control cabinet.

F. Remove existing conduits, wires, and other components that are no longer required and as shown on the Drawings.

G. The existing outer cabinet for VCC and VPC shall be protected in place for future use. The cabinet shall be painted in accordance with requirements of Division 9.
3.05 RESERVOIR OUTLET FLOW METER TRANSMITTER

A. The existing reservoir flow meter transmitter is installed on the reservoir inlet-outlet pipe near the reservoir. The transmitter is currently wired to the existing PLC within the existing VCC.

B. The flow transmitter shall be rewired to the existing PLC inside VCC, which is to be relocated inside the new pump station building.

C. Install new conduits, wires, junction boxes as shown on the Drawings and as required to complete the work.

D. Remove existing conduits and wires as shown on the Drawings and as required to complete the work.

3.06 SIGNALS FROM EXISTING DEVICES

Signals from existing equipment, including reservoir level transmitter, seismic valve PLC, shall be integrated into the new PLC and SCADA system.

3.07 RADIO AND ANTENNA SYSTEM

A. Radio is located inside the existing cabinet near the reservoir. Antenna for the radio is located on the roof of the reservoir. See Drawings for additional information on the locations of the existing radio, antenna and cables.

B. Use existing radio and antenna system for providing communication during construction.

C. Remove existing radio, antenna, and associated cables after new communication system is operational. Radio and antenna shall be delivered to the City’s yard. The remaining removed items shall be disposed of off the site.

D. Existing cabinet for the radio equipment shall be protected in place and painted in accordance with requirements of Division 9.

3.08 RTU

A. RTU is located inside an existing cabinet near reservoir. See Drawings for additional information on the location of the RTU.

B. If required, use existing RTU for temporary controls during construction. See Section 16 20 00 for additional requirements for temporary power and control systems.
C. Remove RTU after it is no longer required and deliver it to the City’s yard.

3.09 CONDUITS AND WIRES

A. Remove conduits and wires as shown on the Drawings.

B. Where specified, abandon belowground conduits in place. Belowground conduits to be abandoned shall be removed up to at least 12” below the finished grade and sealed using plug and tape at all open ends.

C. Modify existing conduits as shown on the Drawing and as required to complete the work.

D. Extend existing conduits as shown on the Drawings and as required to complete the work.

END OF SECTION
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PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Perform field tests as specified herein and as required by the applicable federal, state, and local codes, standards, and regulations.

B. Provide all material, equipment, labor, and technical supervision to perform such tests.

C. It is the intent of these tests to assure that all electrical equipment is operational and within industry and manufacturer's tolerances and is installed in accordance with the Contract Documents and SCE requirements where applicable.

D. The tests shall help determine suitability for energization.

E. The Contractor shall pay for all costs.

1.02 SYSTEM TESTING PARAMETERS

Testing required under this section shall be per the guidelines specified in the NETA publication "Acceptance Testing Specification for Electric Power Distribution Equipment and Systems."

1.03 TESTING FIRM QUALIFICATIONS

A. The tests shall be performed by a corporately independent testing organization that functions as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of equipment or systems evaluated by the testing firm.

B. The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.

C. The testing firm shall have been engaged in such practices for a minimum of five years.

D. The testing firm shall meet federal OSHA criteria for accreditation of testing laboratories, Title 29, Parts 1907, 1910, and 1936. Full membership in the International Electrical Testing Association constitutes proof of such criteria.
E. Testing shall be supervised by a Registered Professional Engineer licensed in the State of California.

F. Testing firm shall utilize only full-time technicians who are regularly employed by the firm for testing services. Electrically unskilled employees are not permitted to perform testing or assistance of any kind. Electricians and/or linemen may assist, but may not perform testing and/or inspection services.

G. The testing firm shall be an independent organization as defined by OSHA Title 29, Part 1936, and the International Electrical Testing Association.

H. All instruments used by the testing firm to evaluate electrical performance shall meet NETA's Specifications for Test Instruments.

I. The testing firm shall be one of the following as approved by the City:
   1. Power Systems Testing Co., Hayward, California
   2. Electrical Engineering and Testing (EETS), Fair Oaks, California
   3. Emerson Process Management, Brea, California
   4. Approved equal

1.04 DIVISION OF RESPONSIBILITY AND COORDINATION OF WORK

A. The Contractor shall perform general equipment inspection and checking procedures recommended by the manufacturer and as specified in other sections of these Specifications prior to and in addition to tests performed by the testing firm specified herein.

B. The Contractor shall supply a suitable and stable source of electrical power to each test site. The testing firm shall specify the specific power requirements.

C. The Contractor shall notify the testing firm when equipment becomes available for acceptance tests. Work shall be coordinated to expedite project scheduling.

D. The Contractor shall notify the City at least 7 days prior to commencement of any testing.

E. The Contractor shall maintain a written record of all tests, and upon completion of project, shall assemble and certify a final test report.

1.05 SUBMITTALS

A. All submittals shall be in accordance with Sections 01 32 19 and 16 00 00.

B. Submittals shall include:
1. Testing firm qualifications, employee resumes, and proof of NETA membership.

2. Proposed testing forms for each component.

3. Proposed testing procedure for each component.

4. Test reports.

PART 2 - PRODUCTS  (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL TESTING PROCEDURES

A. The NETA Acceptance Testing Specifications shall be referenced specifically in this Specifications Section by paragraph numbers. These references will appear as “NETA (paragraph no.)”. The testing agency shall reference these specific paragraphs to determine the specific test requirements for each equipment item tested.

B. The testing agency instruments shall be maintained in calibration per the requirements of NETA 5.2 and 5.3.

C. The test reports shall be in accordance with NETA 5.4 for each piece of equipment or device.

D. Safety procedures per NETA 5.1 shall be adhered to.

E. Any equipment, which does not pass the acceptance tests, shall be repaired, modified, or replaced by the Contractor and retested. Reports shall be submitted to describe the corrective action taken and to verify acceptance on re-testing.

3.02 FIELD TESTING

A. Testing shall be performed in the presence of the City. Testing shall be performed in two separate phases.

B. A typed report shall be submitted after each testing phase is completed. The report shall be submitted to the Engineer for review, comment and record purposes. The report shall include a data sheet for each component (i.e., cable, circuit breaker, transformer, relay, etc.) tested. Each data sheet include the weather conditions at the time of the test (i.e., temperature, humidity, sunny, rain, etc.) the tester’s observation and findings, discrepancies, any
remedial Work performed or act to resolve problems, technical parameters obtained during the tests, as left settings of all devices, and a statement indicating the equipment is ready to be energized. The report shall contain a statement indicating the equipment was tested in accordance with the procedures outlines in the latest editions of The International Testing Association Acceptance Testing Specifications.

C. Step No. 1 – Testing requirements to be performed before the equipment is energized.

1. Inspect and mechanically operate all circuit breakers, power disconnect switches and circuit breakers/disconnect switches installed within equipment furnished under other divisions of these Specifications.

2. Set, calibrate and test all protective devices including but not limited to, circuit breakers, protective relays, timing devices, motor overload, electrical protective devices located with equipment furnished under other Sections of these Specifications. The setting of the overcurrent protective devices shall be as calculated and selected in the protective device coordination and arc flash studies. See Section 16 96 10.

3. Verify that protective relay, current transformers, ground sensing devices, fuses, interrupter switches, transformers, and motor starters furnished are in accordance with the approved shop drawings and the Protective Device Coordination Study.

4. Low voltage cables (600V maximum) shall be tested in accordance with NETA 7.3.2. Megger test all low voltage power system cables.

5. Verify that all power and control power fuses installed are in accordance with the manufacturer’s approved shop drawings, the short circuit, coordination and arc flash studies and the NEC. Replace fuses found to be of the incorrect rating.

6. Verify control circuits and functionality of the controls for all motors. The functionality shall be in accordance with the approved control schematics, wiring diagrams or functional descriptions.

7. Check motor nameplates for correct phase and voltage. Verify motor bearings for proper lubrication.

8. Inspect each piece of electrical equipment in areas designated for installation indoors and outdoors to ensure that equipment of proper rating is installed.

9. Verify the service entrance equipment, power distribution equipment, motors, control cabinet, etc., are properly grounded.
10. The grounding system test shall be performed per requirements of NETA 7.13.

11. Verify all terminations at the transformers, service entrance, motor control center, panelboard, motor starters, and motors are correctly made and properly torqued.

12. Refer to the individual equipment and material Specifications Sections for additional testing requirements.

13. Verify grounding of instrumentation equipment.

14. Test all circuit breakers to confirm their tripping curve. Set circuit breakers in accordance with short circuit, coordination and arc flash studies and test them at the set points.

15. Provide test report stamped and signed by a California Registered Electrical Professional Engineer.

D. Step No. 2 – After the electrical distribution equipment has been energized, perform the following tests:

1. Verify phase rotation at the service entrance, motor control centers and panelboard. The phase rotation shall be A, B, C from front to back, top to bottom, and from left to right.

2. Adjust the taps on the transformers to produce a nominal voltage at the secondary terminals of the transformers.

3. Jog all motors to verify rotation. Disconnect the driven equipment if damage could occur due to incorrect rotation. If the rotation is found to be incorrect, reconnect the motor terminations at the motor terminal box.

4. Check the full load current draw of each motor. Compare the measured value to the rating of the thermal overload devices furnished and verify compliances with the NEC.

5. Perform thermographic survey during operation of the equipment. If the survey indicates existence of hot spots, investigate the matter and correct. Perform another thermographic survey at the concern area to confirm corrections.

6. Submit a typed report stamped and signed by the Registered Electrical Professional Engineer.
SECTION 16 96 10

SHORT-CIRCUIT FAULT CURRENT, PROTECTIVE DEVICE COORDINATION, AND ARC FLASH STUDIES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Obtain services of an independent firm to provide complete short-circuit fault current, protective device coordination, and arc flash studies.

B. Obtain required information from the utility company, SCE, to complete the studies.

C. Prepare reports for the short-circuit fault current, protective device coordination and arc flash studies. The report shall be stamped and signed by a California Registered Electrical Engineer.

1.02 REFERENCE STANDARDS

A. Institute of Electrical and Electronics Engineers, Inc. (IEEE)

B. American National Standards Institute (ANSI)

C. The National Fire Protection Association (NFPA)

D. National Electrical Testing Association (NETA)

1.03 SUBMITTALS

A. Submittals shall be made in accordance with Section 01 32 19 and 16 00 00 and as specified herein.

B. Preliminary: Three copies of preliminary short-circuit fault current and protective device coordination studies shall be submitted to the Engineer for review prior to release of equipment drawings for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing, approval from the Engineer may be obtained for preliminary submittal of sufficient study data to ensure that the selection of device and characteristics will be satisfactory.

C. Final: Results of the final short-circuit fault current, protective device coordination and arc flash studies shall be summarized in a final report.
Submit three hardbound copies of the complete final report and one digital copy in PDF.

1.04 DATA COLLECTION

The firm/individual performing the short-circuit fault current, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data. The Contractor shall collect and furnish all required data. The Contractor shall expedite collection of the data to eliminate unnecessary delays and assure completion of the studies as required for final approval of the equipment shop drawings and/or prior to the release of the equipment for manufacturing.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. The short-circuit fault current analysis and coordination study shall be done as outlined in National Electrical Testing Association (NETA) Testing Specifications, Section 6 with exceptions as included in this Section.

B. In order to select circuit breaker and fuse characteristics as required for optimum coordination, the coordination study shall be performed as soon as the vendors for the new electrical equipment are identified. The circuit breakers and fuse selection by the power distribution equipment suppliers shall be based on the results of the approved study.

C. The studies shall be submitted to the Engineer for acceptance before final acceptance of power distribution equipment submittals and before any settings are made on equipment.

D. The final report for all short-circuit fault current, protection coordination, and arc flash studies shall be bound in a standard 8 ½-in. by 11-in. sized report. The selection of all protective relay types, current transformers, and fuse types and ratings shall be the responsibility of the manufacturer and shall be based on the preliminary draft of the coordination study, which shall be submitted with the equipment shop drawings (or earlier). The studies shall be accepted by the Engineer before any equipment is shipped. See Paragraph 1.03 for submittal requirements.

3.02 SHORT-CIRCUIT FAULT CURRENT STUDY
A. Provide a complete short-circuit fault current study. The short-circuit fault current study shall be calculated for utility power supply and for the City's standby generator supply. The study shall include, but shall not be limited to the following, as applicable:

1. The study shall include utility transformer, 480VAC switchboard, 480VAC motor control center, 480VAC standby generator, automatic transfer switch (ATS), pump motors, and step down 480-208/120VAC transformer and other applicable components.

2. Full compliance with applicable ANSI and IEEE Standards.

3. Performed on nationally recognized computer software, such as EDSA or SKM System Analysis or approved equal.

4. Overall system impedance diagram. The diagram shall include the power company's impedance and X/R ratios and circuit element impedances (e.g. transformers, generators, motors, feeders, distribution buses, as applicable).

5. Available three phase and ground fault asymmetrical and symmetrical short-circuit fault currents at each piece of electrical equipment, bus, transformer, etc.

6. The momentary and interrupting rating of all elements of the distribution system shall be listed. The maximum available short-circuit fault current available at each element shall be calculated.

7. Executive summary describing the distribution system, the procedures used to develop the study, utility related information furnished by the utility company, including the name and telephone number of the individual supplying the information, identification of all assumptions made in the preparation of the study, identification of any problem areas, and a definitive statement concerning the adequacy of the distribution system to interrupt and withstand the maximum possible short-circuit fault current.

8. Computer printouts for the three phase, single phase and ground fault studies. Printouts shall indicate the short-circuit fault current available at each major equipment and distribution bus of 480VAC and 120/240VAC.

3.03 PROTECTIVE DEVICE COORDINATION STUDY

A. Provide a complete Protective Device Coordination Study for the site. The Protective Device Coordination Study shall include the following as applicable, but shall not be limited to:
1. Utility protective devices.

2. Switchboard and motor control center.

3. Standby power generators.

4. Automatic transfer switch.

5. Power system transformers.


7. Settings for protective device, timer, circuit breakers, recommended fuse and current transformer ratings, etc.

8. Transformer excitation current.

9. Motor and cable damage curves in accordance with the manufacturer's recommendations.

10. A complete set of coordination curves for every protective relay, circuit breaker, fuse, timer, etc. serving or located in the electrical equipment furnished for the project, including the utility protective devices.

11. Provide a preliminary short circuit and system coordination report with the electrical equipment shop drawing submittal. The preliminary report shall verify that the equipment is being applied within design ratings and electrical ratings and electrical protective devices will coordinate.


13. Provide a complete set of time-current coordination curves on log paper. Limit the number of protective devices shown on any drawing to a maximum of four. A single line diagram depicting the portion of the distribution system under study shall appear with the curve. The minimum size log paper to be submitted shall be 11.5-in. by 18-in.

14. The time current curves shall include transformer ANSI damage and inrush curves, cable damage curves, circuit breaker and fuse ratings and settings, and any other information required by ANSI and good design practices.

3.04 ARC FLASH STUDY
A. Provide a detailed arc flash study. The study shall include, but shall not be limited to:

1. Determine potential arc flash incident energies, arc flash boundaries, shock hazard boundaries and proper personal protection equipment (PPE) for all energized electrical equipment.

2. The study shall determine worst-case scenarios for the arc flash energy level calculations.

3. Provide executive summary, including introduction, methodology, information sources, key assumptions, NFPA 70E considerations and calculations.

4. Develop and install arc flash warning labels based on arc flash study results. The warning labels shall include the following information.

   • Warning message
   • Flash boundary
   • Maximum arc flash level at flash hazard boundary in cal/cm sq
   • Hazard category and required PPE in accordance with NFPA 70E, Latest Edition
   • Shock hazard when covers removed
   • Limited approach
   • Restricted approach
   • Prohibited approach

3.05 FIELD ADJUSTMENT

A. All field adjustment and modifications shall be performed in the presence of the City’s staff.

B. Adjust protective device settings according to the recommended settings table provided by the coordination study. Field adjustments shall be completed by the equipment manufacturer.

C. Make minor modifications to equipment as required to accomplish conformance with short-circuit fault current and protective device coordination studies.

D. Notify the City in writing of any required major equipment modifications. Major modifications to the equipment shall not be allowed unless otherwise approved in writing by the Engineer.
3.06 ARC FLASH WARNING LABELS

A. The vendor shall provide a 4 in. x 4 in. thermal transfer type label of high adhesion polyester for each work location analyzed. Labels shall be machine printed, with no field markings.

B. The label shall have an orange header with the wording, “WARNING, SHOCK & ARC FLASH HAZARD”, and shall include the following information:

1. Location designation
2. Nominal voltage
3. Arc flash boundary
4. Incident energy
5. Working distance
6. Shock Boundaries
7. PPE requirements
8. Issue date

C. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.

1. For each 480 and applicable 240 volt panelboards and disconnects, one arc flash label shall be provided.
2. For each switchboard, motor control center, and ATS, arc flash label shall be provided.

3.07 ARC FLASH TRAINING

The equipment manufacturer shall provide arc flash training to the City’s staff. At a minimum, the training shall include potential arc flash hazards associated with working on energized equipment and maintenance procedures in accordance with the requirements of NFPA 70E, Standard For Electrical Safety Requirements For Employee Workplaces. Training shall be provided for approximately 4 hours.

END OF SECTION
SECTION 17 40 00
FIELD INSTRUMENTATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, appurtenances and incidentals required and install, calibrate, and test field instruments and equipment, as shown on the Drawings, as specified herein and as required to complete the work.

B. Signals from existing equipment, including the reservoir water level transmitter, seismic valve PLC, and cathodic protection control cabinet shall be integrated into the new PLC and SCADA system.

C. The existing seismic valve control system, including its PLC and flow meter, shall be incorporated into the project. The seismic valve system power and control cabinets (VPC and VCC) shall be relocated to the new pump station building. VPC and VCC shall be wired to new power and the pump station PLC.

1.02 RELATED WORK

A. Electrical General Provisions are included in Section 16 00 00.

B. Raceways, Boxes, Fittings, and Supports are included in Section 16 11 00.

C. Wires and Cables (600 Volt Maximum) are included in Section 16 12 00.

D. Control Cabinet and Controls are included in Section 16 90 00.

E. Modifications to Existing Electrical Components are included in Section 16 95 00.

F. Control Loop Descriptions are included in Section 17 41 00.

1.03 REFERENCE DOCUMENTS

Applicable codes and regulations specified in Section 16 00 00 shall apply towards selection and installation of the instrumentation equipment.

1.04 SUBMITTALS

A. Submittals shall be in accordance with Sections 01 32 19 and 16 00 00.
B. Submittals shall include catalog and detailed technical information for equipment and material to be supplied.

C. Submittals shall include the following as applicable for each item.

1. Manufacturer's name and complete model number.
2. Materials of construction of all components.
3. Physical size with dimensions, enclosure NEMA classification and mounting details.
4. Input/output characteristics.
5. Range, size, span, setpoint, deadbands, etc.
6. Certified calibration data.
7. Wiring diagrams.

D. An instrument list shall be furnished for all instruments supplied under this Specifications Section. The list shall be prepared in EXCEL 2010 format. The instrument list shall be sorted by loop number. The instrumentation list shall contain the following as a minimum:

1. Loop Number
2. Instrument tag name
3. Instrument description
4. Location of instrument
5. Range or Set Point

E. Submit Operation and Maintenance Manuals for all instruments.

F. Submit a Field Test Plan for all equipment. Test plan shall include proposed procedures for field calibration and testing of all instruments, test descriptions, forms, and checklists to be used to control and document the required tests.

G. Submit all test and calibration reports to the Engineer.

### 1.05 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service

B. International Society of Automation (ISA)

1. ISA S5.2 - Binary Logic Diagrams for Process Operations
2. ISA S5.4 - Instrument Loop Diagrams
1.06 QUALITY ASSURANCE

The Contractor shall perform all work necessary to select, furnish, install, connect, program, calibrate, test, and place into operation all hardware specified within this Section and as shown on the Drawings.

1.07 DELIVERY, STORAGE AND HANDLING

A. Shipping Precautions

1. Special instructions for proper field handling, storage and installation required by the manufacturer for proper protection shall be securely attached to the packaging for each piece of equipment prior to shipment. The instructions shall be stored in re-sealable plastic bags or other acceptable means of protection.

B. Identification

1. Each component shall be tagged to identify its location, tag number and function in the system. Identification shall be prominently displayed on the outside of the package.

2. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as given in the Instrumentation List, shall be provided on each piece of equipment supplied under this Section. Equipment not identified in the Instrumentation List shall be identified with a unique number in conformance with the established instrument identification scheme for this project.

C. Storage

1. Equipment shall be stored in dry permanent shelters, including in-line equipment, and shall be adequately protected against mechanical injury.

PART 2 - PRODUCTS

2.01 GENERAL

A. The instrumentation equipment to be supplied for the project shall be factory tested in accordance with the manufacturer’s requirements. Manufacturer testing affidavits shall be provided.
B. Equipment enclosures shall have NEMA ratings suitable for the location in which they are installed as specified in Section 16 00 00.

C. All electronic instrumentation shall be of the solid-state type and shall utilize linear transmission signals of 4 to 20 mA DC (milliampere direct current).

D. Outputs of equipment that are not of the standard signals as outlined shall have the output immediately raised and/or converted to compatible standard signals for remote transmission. No zero-based signals will be allowed.

E. All transmitters shall be provided with either integral indicators or conduit mounted indicators in linear process units, accurate to two percent.

F. Electronic equipment shall be suitably coated to prevent contamination by dust, moisture, and fungus. Solid-state components shall be conservatively rated for their purpose, to assure optimum long-term performance and dependability.

G. All equipment, cabinets, and devices furnished shall be heavy-duty type designed for continuous industrial service. All equipment provided shall be of modular construction and shall be capable of field expansion.

H. Electrical

1. All equipment shall be designed to operate on a 60 Hertz alternating current power source at a nominal 117 volts, plus or minus 10 percent, except where specifically noted or loop powered at 24VDC. All regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

2. All analog transmitter and controller outputs shall be 4-20 mA into a load of a minimum of 0-600 ohms, unless specifically noted otherwise.

3. Materials and equipment used shall be UL approved wherever such approved equipment and materials are available.

I. Direct reading or electrical transmitting instrumentation shall not be mounted on process piping. Instrumentation shall be mounted on instrument racks or stands adjacent to piping. Provide isolation valves and flexible connections to process piping.

J. Field instruments requiring power supplies shall be provided with local electrical shutoffs and fuses as required.
K. The shield on each process instrumentation cable shall be continuous and completely insulated from source to destination and be grounded as directed by the manufacturer of the instrumentation equipment, but in no case shall more than one ground point be employed for each shield. In general, signals shall be grounded at a single point in the control panel location.

L. All equipment shall be designed and constructed such that in the event of a power interruption, the equipment specified shall resume normal operation without manual resetting when power is restored.

2.02 TUBING AND FITTINGS

A. All instrumentation connections shall be provided with shutoff and drain valves. Fittings shall be Swagelok 316 stainless steel or equal and valves shall be Whitney 316 stainless steel or equal.

B. All instrument tubing shall be fully annealed ASTM A269 Seamless 316 grade, free of scratches, and having the following dimensional characteristics as required to fit the specific installation:

1. 1/4 to 1/2-inch OD of required wall thickness

2. Tubing shall be rated for 300 psi minimum

C. All process connections to instruments shall be annealed 1/2-inch OD stainless steel tubing, Type 316.

D. All tubing shall be supported by stainless steel hardware and installed in accordance with manufacturer's installation instructions.

2.03 MOUNTING MATERIAL

A. All instruments shall be provided with mounting devices as recommended by the manufacturer, as required for proper installation, and as supplemented on the Drawings and herein.

B. Mounting devices shall include galvanized tubing, struts, posts, channels, hangers, brackets, U-bolts, floor stands, base plates, flanges, etc. as required. All hardware and anchors shall be Type 316 stainless steel.

2.04 PRESSURE GAUGE

A. Type:

1. Bourdon tube actuated pressure gauge
B. Functional/Performance:

1. Accuracy - Plus or minus 1.0 percent of span or better

C. Physical:

1. Case - Phenolic shock resistant or 316 stainless steel for surface/stem mounting with a pressure relieving back. The case shall be vented for temperature/atmospheric compensation. Gauge shall be the no-fill type.

2. Window - Clear acrylic or shatterproof glass

3. Bourdon Tube - 316 stainless steel

4. Connection - 1/2-inch NPT

5. Gauge size - 6.0-inch minimum

6. Pointer travel - Not less than 200 degrees nor more than 270-degree arc

7. Range – 0 to 150 psi

D. Accessories/Options Required:

1. Shutoff valve - Each gauge shall have a process shutoff valve which can also be used as an adjustable pressure snubber.

2. Special scales - Engineer reserves the right to require special scales and/or calibration if the manufacturer's standard is not suitable for the application.

E. Manufacturers:

1. McDaniel Controls
2. WEKSLAR
3. Ametek - U.S. Gauge Division
4. Ashcroft
5. Approved equal

2.05 PRESSURE TRANSMITTER

A. Type: Two-wire, capacitance or solid-state based, high performance pressure transmitter with H.A.R.T. based digital communications capabilities; small, lightweight design.

B. Operation Purpose: To sense pressure and produce a standard current output signal linear with pressure; sensing element - capacitance cell; circuitry - solid
state with software selectable square root extraction; indicator - integrally mounted scaled in engineering units; bypass manifold - stainless steel three valve type.

C. Functional: Static pressure limit - 2000 PSIG; power supply - DC (loop powered); output - 4-20 ma DC; communications protocol - H.A.R.T.; integral zero and span adjustments; integral 4-digit LCD indicator; nonvolatile memory; self-diagnostic capability.

D. Physical: Wetted parts - 316 stainless steel, glass filled TFE; body material - low-copper aluminum or 316 stainless steel; electronics housing - NEMA 4X with FM approval; process connections 1/2-inch NPT; traditional bi-planar design flange.

E. Performance: Accuracy - plus or minus 0.075% of span over a 100:1 range, including the combined effects of linearity, hysteresis and repeatability; stability - plus or minus 0.10% of URL for a 12-month period; static pressure effect - (zero error) plus or minus 0.10% of URL per 1,000 PSI, (span) plus or minus 0.20% of reading per 1000 PSI; temperature effect - plus or minus 0.025% of URL plus 0.125% of span per 50 degrees F; vibration effect - plus or minus 0.1% of URL per g when tested from 15 to 2,000 Hz in any axis.

F. Manufacturer: Rosemount Model Gauge 3051T Series with 306R block and bleed manifold, no equal.

2.06 INTRUSION SWITCHES

The intrusion switch shall be rated .8 amperes at 115VAC and shall be activated upon entry. The intrusion switch shall be installed at the pump station building door and shall be two-piece, magnet actuated, reed proximity switch, Micro Switch Type 20FR, or approved equal. Provide required brackets, tubing, striking plates, clamps, anchors, and stainless-steel hardware for proper installation and operation of intrusion switches.

2.07 WATER LEVEL ELECTRODES

A. Discharge Surge Tank

Three level electrodes shall be installed to monitor discharge surge tank water level and operation of the air compressor. The electrodes shall be wire suspended and provided with plastic protection, Charles F. Warrick Series 3W. No substitutes. The electrodes shall be suspended from electrode holder Series 3E. No substitutes.
B. Pump Suction Water Level Electrodes

Each pump shall be provided with level electrodes and electrode holder to monitor suction water level. The electrodes shall be Charles F. Warrick Series 3R, stainless steel, PVC coated, and with required length. The electrodes shall be suspended from electrode holder Series 3E or equal.

2.08 PRESSURE SWITCHES

A. Four pressure switches shall be provided and installed at the project.

B. One pressure switch shall monitor the discharge pressure of the pump station. The pressure switches shall be of electronic type and shall have the following characteristics.

- Service: Potable water
- Wetted Materials: 316L SS
- Housing: Glass filled plastic
- Accuracy: 1% of FS
- Pressure Limits: Up to 6000 PSI
- Process Connection: 1/4" NPT male
- Display: 4-digit backlit LCD (Digits: 0.60"H x 0.33"W)
- Power Requirements: 12 to 28 V DC/AC 50/60 Hz. For T5 option: 14 to 30 V DC/AC 50/60 Hz.
- Enclosure Type: Weatherproof Type 4X/IP65
- The pressure switches shall be provided with 2 SPDT relays. The electrical rating of the relay contacts shall be 5A@120/240VAC.
- The pressure switches shall be provided with double setpoints (low and high) and 0-100% of full-scale adjustment.
- Transmitter Specifications:
  - 4 – 20 mA, 1 – 6 VDC, 1 – 5 VDC, 0 – 5 VDC, or 0 – 10 VDC (direct or reverse output selection).
  - Minimum Excitation: 14 VDC
  - Zero and Span Adjustments: Menu scalable within the range.
- The pressure switches shall be Dwyer Instruments, Inc. Mercoid Series EDA or approved equal.

C. Three pressure switches shall be installed at each pump discharge as shown on the drawings. The switches shall have the following characteristics:

- The pressure switches shall have a single pole, single throw switch.
- The switches shall have weatherproof enclosures.
- The switches shall have and adjustable operating range of 10-200 PSI.
- The switches shall reset at minimum differential.
• The switches shall be Dwyer Instruments, Inc. Mercoid Series DAW or approved equal.

2.09 FLOW METER

Flow meter shall be in accordance with Section 11 30 00.

2.10 WATER LEVEL TRANSMITTER (Existing)

The existing reservoir level transmitter shall be used. See Section 16 95 00 for additional requirements.

2.11 SEISMIC VALVE SYSTEM (Existing)

The existing valve system components, including valve power cabinet, valve control cabinet, flow meter, and PLC, shall be used. See Section 16 95 00 for additional requirements.

2.12 TANK CATHODIC PROTECTION SYSTEM (Existing)

The existing steel tank cathodic protection system shall be used. See Section 16 95 00 for additional requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General

1. The instrumentation system equipment shall be installed in accordance with the manufacturer's instructions and located as shown on the Drawings or as approved by the Engineer.

2. The electrical schematics indicate the intent of the interconnection between the individual instruments. Any exceptions shall be noted and brought to the attention of the Engineer in writing during shop drawing submittals.

3. Local 120-volt power lockable disconnects shall be provided for all instruments by either an instrument mounted power on-off switch or a separately mounted switch.

B. Equipment Mounting

1. Field instruments shall be mounted in accordance with the manufacturer's recommendations.
2. Install galvanized mounting system comprised of galvanized tubing, struts, posts, channels, hangers, brackets, U-bolts, floor stands, base plates, flanges, etc. as required. All hardware and anchors shall be Type 316 stainless steel.

3. Instruments attached directly to concrete or masonry shall be spaced out from the mounting surface not less than 1/2-inch.

4. Unless otherwise noted, field instruments, except transmitters and gauges, shall be mounted between 48 and 60 inches above the floor or work area.

C. All piping and tubing to and from field instrumentation shall be provided with necessary unions, test tees, couplings, adapters, and shut-off valves. Process tubing shall be installed to slope from the instrument toward process for gas measurement service and from the process toward the instrument for liquid measurement service. Provide drain/vent valves or fittings at any process tubing points where the required slopes cannot be maintained.

D. Termination of Instrumentation Cables
   1. Use ferrules for terminating wires at the terminals.
   2. Insulate drain wire of TSP cables from inadvertent grounding.
   3. Install heat shrink insulating boots at cable ends.
   4. Electronic components like resistors, MOVs, and diodes shall have dedicated terminals.

3.02 CALIBRATION

A. All instrumentation and equipment shall be field calibrated in the presence of the City’s staff and as required by the manufacturer. Submit calibration test report in approved ISA format (including original, signed and dated field copies) for all field instrumentation, panel instruments, and equipment.

B. The Contractor shall furnish the services of the manufacturer’s field service Representative, all special tools, calibration equipment and labor to perform the required calibration and adjustment.

C. Perform field calibration with zero and span adjustments set to values determined by the City, documented in control strategies, or necessitated by process programmed into PLC/HMI/OIT.
D. Submit reports of field calibration of each instrument and equipment, including "as-found" and "as-left" data.

3.03 CORRECTION OF DEFICIENCIES

A. All deficiencies in work and/or items not meeting specified testing requirements shall be corrected in order to meet Specifications requirements at no additional cost to the City.

B. Testing shall be repeated after correction of deficiencies is made. The correction of deficiencies shall be implemented until the specified requirements are met. This work shall be performed at no additional cost to the City.

3.04 FACTORY TEST

The instrumentation equipment to be supplied for the project shall be factory tested in accordance with the manufacturer’s requirements.

3.05 EXISTING EQUIPMENT

Signals from existing equipment, including the reservoir water level transmitter, seismic valve PLC, and cathodic protection control cabinet shall be integrated into the new PLC and SCADA system.

3.06 FIELD TESTS

A. Point-to-Point Testing:

1. Perform point-to-point testing of all control loops involving field wiring and instrumentation and for all loops.

2. It shall be the Contractor’s responsibility to confirm that field wiring and instrumentation of each control loop is intact and provides inputs as required.

3. Tests shall include "round-trip" loop resistance of cable with field device shorted.

4. Submit reports for Point-to-Point testing.

B. The Test Plan shall form the basis of the documentation of the instrumentation system acceptance tests.

1. The Contractor shall plan and design the tests that are required to demonstrate the functional performance of the equipment provided and submit to the Engineer for acceptance before testing.
2. The field test shall include any spare hardware and equipment provided by the Contractor and shall include the entire piece of equipment.

3. The goal of the field test is to assure immediate and proper operation of the equipment when the City takes possession of the facility. Proper operation shall include:

   a. All equipment is operable.
   b. Field devices are calibrated.
   c. Panel mounted monitoring and control equipment are functioning correctly.

C. Initial Field Acceptance Tests

   1. The Contractor shall perform an initial field functional test when the system is available for operation. The Contractor shall certify that the field functional test has been completed and passed in accordance with the plan.

D. Final Field Acceptance Tests

   1. Once the initial field test has been certified as complete and the Test Plan has been approved, the Contractor shall conduct a final field test to be witnessed by the City’s staff. The schedule of the final field test shall be coordinated and pre-approved by the City’s staff.

   2. After successful completion of the final field test, the City will approve/accept the functional test in writing.

E. The Contractor shall furnish the services of the manufacturer's field service representative, all special tools, calibration equipment and labor to perform the tests.

END OF SECTION
SECTION 17 41 00

CONTROL LOOP DESCRIPTIONS

1.01 SCOPE OF WORK

The loop descriptions, together with the process and instrumentation diagrams (P&ID) and control wiring diagrams, comprise the functional design criteria of the instrumentation and control system.

The P&ID diagrams represent the basic concept of the instrumentation and control system, whereas the loop descriptions supplement the drawings.

A. Loop 001 – Pump Station Rate of Flow

1. General:

- The loop description provides generic requirements for monitoring of a given pump station rate of flow and total flow. The flow meter system consists of the flow tube (flow sensor) FE001 and flow meter amplifier FIT001.

- Flow meter amplifier FIT001 measures pumped water flow to Wilder Pressure Zone.

- The flow meter amplifier FIT001 produces a 4-20 mA DC signal that is proportional to the rate of flow. The electronic totalizer is part of the flow meter amplifier assembly.

2. Control: None

3. Monitoring:

a. Local (at instrument)
   - Flow Sensor (Flow Tube) FE001.
   - Flow Meter amplifier FIT001.

b. At Pump Station Control Panel (PSCP)
   - The flow signal shall be provided to the pump station RTU/PLC (FR001).
   - The rate of flow (FI001A) shall be displayed at the pump station display panel.

   - Total Flow. An analog 4-20 mA DC flow rate signal from the flow transmitter shall be totalized in the PLC/RTU by FR001 function. The
total flow FQ001A shall be displayed at the PSCP.

c. At Supervisory Control Station (SCS)
   • Pump station flow FI001B.
   • Total flow FQ001B.

B. Loop 003 – Pump Station Discharge Pressure

1. General: The control loop shall provide for monitoring of the pump station discharge pressure by means of the pressure switch PSH003. After the switch is activated for a preset time, the RTU/PLC logic shall set the high discharge pressure alarm PR003 and shall trip all pumps.

2. Control:

   • The high pressure signal shall trip all pumps when the pumps are in Auto mode of control. See Control Loops 101, 201 and 301.

3. Monitoring:

   a. Local
      • High discharge pressure switch PSH003.

   b. At PSCP
      • High discharge pressure digital input to RTU/PLC (PR003).
      • Pump station high discharge pressure alarm PSHA003A (at PSCP).

   c. At SCS
      • Pump station high discharge pressure alarm PSHA003B.

C. Loop 004 – Pump Station Power Fail

1. General: The control loop shall continuously monitor the electrical power supplying the pump station. The power monitoring relay ER004 of power monitor JI005 contact shall be wired to the pump station RTU/PLC as ERL004 and JIR005, respectively.

2. Control:

   a. Local
      • Upon receiving a power fail signal (ER004) from the power monitor (JI005), the RTU/PLC logic ERL004 shall set an alarm and shall send a trip signal to all pump controls. See Loops 101, 201, and 301 for pump control.
3. Monitoring:

   a. Local
      - Power fail alarm, ERA004A, shall be displayed at the PSCP.

   b. At SCS
      - Power fail alarm ERA004B.

D. Loop 005 – Pump Station Power Monitoring

1. General: The control loop shall continuously monitor the real power (kW) supplying the pump station.

2. Control: None.

3. Monitoring:

   a. Local
      - The power monitor JI005, wired to the pump station power supply source.
      - A 4-20 mA DC signal (JI005/kW), proportional to the measured real power, shall be wired to the pump station RTU/PLC. The RTU/PLC shall record the real power signal (JIR005/kW) for transmission to SCS.
      - Pump station real power JI005A/kW shall be displayed at PSCP.

   b. At SCS
      - Pump station real power JI005B/kW.

E. Loop 006 – UPS Alarms

1. General: The loop shall monitor the Uninterruptible Power Supply.

2. Control: None

3. Monitoring:

   a. Local
      - Uninterruptible Power Supply. UPS Inverter On UX006A and UPS Trouble UX006B signals shall be wired to the RTU/PLC inputs. The signals shall be recorded by the RTU/PLC (UR006A, UR006B) and shall be displayed at the PSCP as alarms (UXA006A, UXA006B).

   b. At SCS
      - UPS Inverter On UXA006C.
      - UPS Trouble UXA006D.
F. Loop 007 – Pump Station Intrusion

1. General: The loop shall monitor pump station building entry.

2. Control: None

3. Monitoring:
   
   a. Local
      • When the intrusion switch ZS007A or ZS007B is activated, the signal shall be sent to the pump station RTU/PLC. The RTU/PLC shall accept the signal (ZSR007A or ZSR007B) and shall start timing it. The time delay shall be sufficient for the operator to disable the intrusion entry alarm using pump station display panel (PSCP) entry HK007. The disabling of the intrusion alarm by the operator shall be interlocked through the operator ID number and the password and shall initiate the intrusion alarm disabled display ZI007 at PSCP. If the intrusion logic is not disabled after a predetermined time delay, the RTU/PLC shall set internal, silent alarm ZSA007 for transmission to SCS.

   b. At SCS
      • Intrusion alarm ZSA007

G. Loop 008 – Local Reservoir Level (La Granada Reservoir Level)

1. General: The loop shall monitor local (La Granada) reservoir water level at the pump station site. The reservoir has the existing level transmitter (LIT008) that produces 4-20 mA DC signal proportional to the reservoir level.

2. Control:
   
   a. Local
      • Setting of Low and High Reservoir Level Alarm setpoints from PSCP (HK008A).

   b. From SCS
      • Setting of Low and High Reservoir Level Alarm setpoints (HK008B).

3. Monitoring:
   
   a. Local
      • Level Sensor LE008.
      • Level signal from the level transmitter LIT008 shall be wired to the
RTU/PLC input (LR008).

- The local reservoir level LI008A shall be displayed at the PSCP.
- The PLC logic shall compare the reservoir level against the preset high and low setpoints. If the reservoir level increases above the high setpoint for a predetermined time, the Reservoir Level High alarm LHA008A shall be set, sealed in, and displayed at the operator display panel. Decrease of the reservoir level below a low setpoint shall cause Reservoir Level Low alarm LLA008A and display at the operator display panel. It shall be possible to reset both alarms from the PSCP.

b. At SCS
- Reservoir Level LI008B.
- Reservoir Level High alarm LHA008B.
- Reservoir Level Low alarm LLA008B.

H. Loop 009 – Remote Reservoir Level (Wilder Reservoir)

1. General: This control loop shall monitor the remote (controlling) reservoir level LIT009 signal. The pumps at La Granada Pump Station are controlled by the water levels in the remote reservoir. The controlling reservoir for the La Granada Pump Station shall be Wilder Reservoir.

2. Control:

a. Local
- The remote (controlling) reservoir level signal LIT009, transmitted over SCADA, is recorded by pump station RTU/PLC (LR009). The PLC logic shall compare the reservoir level signal to the preset start/stop set points for Lead, Lag 1 and Fire Pump and shall activate relevant pump start/stop logical modules.
- Selection of start/stop set points for Lead and Lag 1 from PSCP (HK009A).

b. From SCS
- Selection of the start/stop set points for Lead, Lag 1 and Fire Pump pumps (HK009B).
3. Monitoring:

   a. Local
      • Remote (controlling) reservoir level (LI009A) shall be displayed at the PSCP.
      • Selected set points for Lead, Lag 1 and Fire pumps (selected at the pump station or SCS) shall be displayed at PSCP (HK009A).

   b. At SCS
      • Remote (controlling) reservoir levels (LI009B).
      • Selected start/stop set points for Lead, Lag 1 and Fire pumps (selected at the pump station or SCS) shall be displayed (HK009B).

I. Loop 013 – Pump Sequence Selection

   1. General: This control loop shall provide for selection of the pump Lead and Lag 1 sequence.

   2. Control:

      a. Local
         • The RTU/PLC logic shall provide for selection of the required pump sequence (Lead and Lag 1) using PSCP display (HS013A_LL). The selection of the pump sequence shall be recorded by RTU/PLC (NR013) and provided to other control loops for starting and stopping of the pumps in accordance with this selection (NR013A and NR013B).

      b. From SCS
         • The RTU/PLC logic shall provide for selection of the pump sequence from the SCS central computer (HS013B_LL).

   3. Monitoring:

      a. Local
         • Selected current pump sequence shall be displayed at the PSCP (UI013A).

      • At SCS Selected current pump sequence display (UI013B).

J. Loop 014 – Pump Station Reset

   1. General: The control loop shall provide for resetting of sealed-in alarms after the alarm variable returns to normal.
2. Control:

a. Local
   - After depressing pushbutton HS014, all alarms shall be reset, provided that the alarm variable has returned to normal. The reset pushbutton action shall be recorded by RTU/PLC (YR014).
   - Depressing of HS014 pushbutton shall also energize all Low Suction relays (CR102, CR202 and CR302) if suction pressure returns to a preset value.

b. From SCS – None

K. Loop 019 – Discharge Surge Tank Water Level Control

1. General: This loop shall provide for control of the water level in the discharge surge tank.

2. Control:

   a. Local
      - Two level probes (low and high, LE019) shall be installed in the surge tank and wired to the level relay LR019. The relay, together with time delay relay TD019, shall control the air compressor. When the water level in the tank is too high (water is above the high probe setting), none of the pumps are running, and after the time delay (TD019), the air compressor shall be started to increase air pressure/volume in the tank. The compressed air shall lower the water level below the setting of the low probe and the air compressor shall be stopped.

   b. At SCS: None

3. Monitoring:

   a. Local
      - Air Compressor Running RTU/PLC input KY019.
      - Air Compressor Running indication XI019A.

   b. At SCS
      - Air Compressor Running indication XI019B.

L. Loop 020 – Time of Use

1. General: This control loop shall provide for setting of time periods when the pump station (Pump P1 and P2) is allowed to operate. The selection of the time-of-use periods shall meet the City of Thousand Oaks actual utility tariff.
2. Control:

   a. Local: A time-of-use logic KY020 shall be programmed in the pump station RTU/PLC in order to prevent pumps from running during high and mid-peak periods. The setting of the time-of-use periods shall be possible from the PSCP using soft selector switch HS020A. Setting of the time-of-use periods shall be protected by a password and shall be recorded by the SCADA central computer.

   b. At SCS:

      It shall be possible to set the time-of-use periods from the SCS central computer (HS020B). Any change should be protected by a password and shall be recorded by the central computer.

3. Monitoring:

   a. Local
      • Indication of the actual Time-of-Use settings at PSCP (HSI020A).

   b. At SCS
      Indication of the actual time-of-use settings (HSI020B).

M. Loop 030 – Generator Running

   1. Monitoring:

      a. Local
         • Generator running ER030.

      b. At PSCP
         • Generator running ERL030.

      c. At SCS
         • Generator Running ERA030.

N. Loop 031 – Generator KW

   1. Monitoring:

      a. Local
         • Generator KW JI031.
b. At PSCP
   • Generator KW JI031.

c. At SCS
   • Generator KW JI031.

O. Loop 032 – Generator Alarm

1. Monitoring:
   a. Local
      • Generator alarm XA032.
   
   b. At PSCP
      • Generator alarm UXA032.
   
   c. At SCS
      • Generator alarm UXA032C.

P. Loop 033 – Generator Warning

1. Monitoring:
   a. Local
      • Generator warning XA033.
   
   b. At PSCP
      • Generator warning UXA033.
   
   c. At SCS
      • Generator warning UXA033D.

Q. Loop 034 – ATS Normal

1. Monitoring:
   a. Local
      • ATS Normal ER034.
   
   b. At PSCP
      • ATS Normal ERL034.
   
   c. At SCS
      • ATS Normal ERA034.
R. Loop 035 – ATS Emergency

1. Monitoring:
   a. Local
      • ATS Emergency ER035.
   b. At PSCP
      • ATS Emergency ERL035.
   c. At SCS
      • ATS Emergency ERA035.

S. Loop 101 – Pump P1 Control

1. General: This control loop shall provide for control of the Pump P1.

2. Control:
   a. Local
      • Pump P1 Control. The pump shall have two modes of control, selected by the position of Hand-Off-Auto selector switch HS101A. It shall not be possible to start the pump neither in Hand mode nor in Auto mode when the selector switch is turned to Off position.

   - Starting of the Pump: After the pump is started and exerts a proper pressure, the pump control valve will open slowly in order to avoid water hammers.

   - Hand Mode: When the selector switch is turned to Hand position, the start/stop relay CR101 shall be energized provided Pump Suction Low Level relay CR102 is not de-energized. The CR101 relay shall energize the pump motor starter and the pump should start.

   - Auto Mode: In Auto mode of control, the pump shall be started and stopped by the RTU/PLC logic on the remote reservoir level signal. The remote reservoir level signal LIT009 (see Loop 009), transmitted to the local RTU/PLC, shall be compared against pre-determined start setpoints. When the reservoir level drops below a given setpoint for a pre-determined time, the RTU/PLC logic shall call for a selected pump (Lead or Lag 1) to run. A call signal XY110A or XY110B shall be generated to the pump selected by the pump.
sequence logic. The Pump Call relay of the pump (CR101) shall be energized after a pre-determined time.

□ Stopping of the Pump

- Hand Mode: When the selector switch HS101A is turned to Off position, the CR101 relay shall be de-energized.

- Auto Mode: When the controlling reservoir level reaches the pre-set set point or fire pump P3 is started, the Pump Call signal shall be removed, the Pump Call relay CR101 shall be de-energized, the starter Run relay M101 shall be de-energized, and the pump motor shall be ramped down to stop.

□ Pump Control Shutdowns:

- Hand Mode: When in Hand Mode, the pump shall be shut down on Low Suction Level alarm only. See Loop 102.

- Auto Mode: In Auto mode of control, the pump should be shutdown on the following alarms.

  o Pump Station High Discharge Pressure. See Loop 003.
  o Pump Station Power Fail. See Loop 004.
  o Time-of-use parameter. If the current time is outside of the TOU window, the pump shall be shut down or not allowed to run. See Loop 020.
  o Pump Low Suction Level. See Loop 102.
  o Pump Fail. See Loop 103.
  o When pump P3 is called to run, Pump P1 will be shutdown (software interlock).

b. From SCS

- The PLC logic shall provide for starting and stopping the pump from the SCADA central computer (HS101B), providing that Local H-O-A switch (HS101A) is set to Auto position.

3. Monitoring:

a. Local

  • At Pump Station Display Panel PSCP

    □ Pump Run indication XI101A.
    □ Pump Run Hours Totalizer XQ101.
    □ Pump Run Hours ETM101A.
    □ Pump Not in Auto alarm XLA101A.
b. At SCS
   - Pump Run XI101B.
   - Pump Run Hours ETM101B.
   - Pump Not in Auto XLA101B.

T. Loop 102 – Pump P1 Low Suction Level

1. General: This loop shall provide for monitoring of the pump suction level. When the suction water level drops below the setting of the electrode, the pump running in either Hand or Auto mode shall be shut down.

2. Control:
   a. Local (At Pump)
      - Pump electrode LE102.
   b. Local (At PSCP)
      - Level relay LR102.
      - Auxiliary relay CR102.
   c. At SCS – None

3. Monitoring:
   a. Local
      - A Pump Low Suction Level Shutdown alarm LLA102A shall be displayed at operator display panel.
   b. At SCS
      - Pump Low Suction Level Shutdown alarm LLA102B.

U. Loop 103 – Pump P1 Pressure

1. General: This loop shall monitor pump discharge pressure.

2. Control:
   a. Local: The pressure switch PS103 shall be activated when the pressure increases above a preset value. Closure of the switch’s normally open (NO) contact shall provide input to RTU/PLC.
   b. At SCS – None
3. Monitoring: If the pump does not develop required pressure (settings at PS103 switch) in a pre-selected time, the PLC logic shall set Pump Fail alarm PSA103.

   a. Local:
      • Pump Fail alarm XLA103A shall be displayed at the operator display panel.

   b. At SCS
      • Pump Fail alarm XLA103B.

V. Loop 104 – Pump Control Valve

1. General: This loop shall control operation of the pump control valve. The valve shall be opened after the pump is running and developing sufficient pressure (monitored by switch PS103). The valve shall be closed before the pump is stopped. A pump discharge valve fail to open alarm will be generated upon discharge valve failure to open. PLC will subsequently shut down the pump whenever the discharge valve fail to open alarm occurs. This alarm will be displayed in SCADA as well.

2. Control:

   a. Local – At PSCP
      • At PSCP. Opening and closing of the valve shall be accomplished by energizing the valves solenoid SOV104. The valve shall be opened/closed through the action of the CR101, CR103 and CR105 relays. See description of Loops 101 and 103 for details. The opening of the valve shall be monitored by the RTU/PLC logic. The control logic shall provide shutdown alarm XA104A to the pump start/stop control when the valve does not open in a predetermined time.

   b. At SCS – None

3. Monitoring:

   a. Local
      • At PSCP. The valve position limit switches ZS104A and ZS104B shall activate RTU/PLC inputs through relays CR104A (Valve Open), CR104B (Valve Closed), XI-104A-A, XI-104B-A and pilot lights ZSL104A and ZSL104B.

      • The Pump Control Valve Fail XA104A signal shall be displayed at the operator display panel.
b. At SCS
- Valve positions XI104A-B and XI104B-B.
- Pump Control Valve Fail XA104B.

W. Loop 110 – Pump Call

1. General: This loop shall provide for selection of a pump based on the remote reservoir signal level and current pump sequence.

2. Control:
   a. Local. The RTU/PLC shall generate a call signal (XY110A, XY110B, or XY110C) to the selected pump start/stop logical module.
   b. At SCS – None

3. Monitoring:
   a. Local at PSCP
      - Pump P1 call signal indication XI110A-A
      - Pump P2 call signal indication XI110B-A
      - Pump P3 (Fire Pump) call signal indication XI110C-A
   b. At SCS
      - Pump P1 call signal indication XI110A-B
      - Pump P2 call signal indication XI110B-B
      - Pump P3 (Fire Pump) call signal indication XI110C-B

X. Loop 111 – La Granada Reservoir Outlet Flow

1. General:
   - The control loop shall provide for monitoring of the La Granada Reservoir outlet flow and closing of the outlet valve if the flow increases above a preset value.
   - The closing of the outlet valve is provided by an existing, standalone control system provided with its own programmable logic controller.
   - The reservoir outlet flow is monitored by the existing flow meter FT111A. The 4-20 mA DC signal from the flow meter is provided to Valve Control Cabinet/Panel (VCC). The VCC compares the flow to a preset set point (increase of flow above that set point indicates possible rupture downstream of the reservoir) and closes the valve if the flow is in excess.
• The valve control and power system is existing and not part of the current project.
• The flow signal, status of the valve, and seismic system status and health shall be provided to the new pump station RTU/PLC for transmission to the SCADA central computer.

2. Control:

• No control to be performed by the pump station RTU/PLC.

3. Monitoring:

a. Local – In the Outlet Pipe
   • Flow Transmitter FT111.

b. Local – At Valve Control Cabinet (VCC).
   • Signal isolator FY111 separating FT111A flow signal to the valve control from the signal to pump station RTU/PLC.
   • Flow signal (FT111B) from signal isolator shall be provided to the RTU/PLC (FR111).

c. Local – At PLC/RTU
   • Outlet valve open input ZSOR111.
   • Outlet valve closed input ZSCR111.
   • Seismic control system activated input NAR111A.
   • Seismic control system malfunctioning NAR111B.

d. Local – At PSCP
   • Outlet flow indication FI111A.
   • Outlet valve open ZSOI111A.
   • Outlet valve closed ZSCI111A.
   • Seismic control system activated alarm NA111A.
   • Seismic control system malfunctioning alarm NA111B.

e. At SCS
   • Outlet flow indication FI111B.
   • Outlet valve open ZSOI111B.
   • Outlet valve closed ZSCI111B.
   • Seismic control system activated alarm NA111C.
   • Seismic control system malfunctioning alarm NA111D.

Y. Loop 201 – Pump P2 Control

1. General: This control loop shall provide for control of the Pump P2.
2. Control:

   a. Local
      - Pump P2 Control. The pump shall have two modes of control, selected by the position of Hand-Off-Auto selector switch HS201A. It shall not be possible to start the pump neither in Hand mode nor in Auto mode when the selector switch is turned to Off position.

         ☐ Starting of the Pump: After the pump is started and exerts a proper pressure, the pump control valve will open slowly in order to avoid water hammers.

         - Hand Mode: When the selector switch is turned to Hand position, the start/stop relay CR201 shall be energized provided Pump Suction Low Level relay CR202 is not de-energized. The CR201 relay shall energize the pump starter and the pump should start.

         - Auto Mode: In Auto mode of control, the pump shall be started and stopped by the RTU/PLC logic on remote reservoir level signal or if fire pump P3 is started. The remote reservoir level signal LIT009 (see Loop 009), transmitted to the local RTU/PLC, shall be compared against pre-determined start setpoints. When the reservoir level drops below a given setpoint for a pre-determined time, the RTU/PLC logic shall call for a selected pump (Lead, Lag 1 or Lag 2) to run. A call signal XY110A or XY110B shall be generated to the pump selected by the pump sequence logic. The Pump Call relay of the pump (CR201) shall be energized after a pre-determined time.

         ☐ Stopping of the Pump

         - Hand Mode: When the selector switch HS201A is turned to Off position, the CR201 relay shall be de-energized.

         - Auto Mode: When the controlling reservoir level reaches a preset set point, the Pump Call signal shall be removed, the Pump Call relay CR201 shall be de-energized, the starter Run relay M201 shall be de-energized and the pump motor shall be ramped down to stop.
Pump Control Shutdowns:

- **Hand Mode:** When in Hand Mode, the pump shall be shut down on Low Suction Level alarm only. See Loop 202.

- **Auto Mode:** In Auto mode of control, the pump should be shut down on the following alarms.
  
  - Pump Station High Discharge Pressure. See Loop 003.
  - Pump Station Power Fail. See Loop 004.
  - Time-of-use parameter. If the current time is outside of the TOU window, the pump shall be shut down or not allowed to run. See Loop 020.
  - Pump Low Suction Level. See Loop 202.
  - Pump Fail. See Loop 203.
  - When pump P3 is called to run Pump P2 will be shutdown (software interlock).

b. From SCS

- The PLC logic shall provide for starting and stopping the pump from the SCADA central computer (HS201B), providing that Local H-O-A switch (HS201A) is set to Auto position.

3. Monitoring:

a. Local

  - At Pump Station Display Panel PSCP
    
    - Pump Run indication XI201A.
    - Pump Run Hours Totalizer XQ201.
    - Pump Run Hours ETM201A.
    - Pump Not in Auto alarm XLA201A.

b. At SCS

  - Pump Run XI201B.
  - Pump Run Hours ETM201B.
  - Pump Not in Auto XLA201B.

Z. Loop 202 – Pump P2 Low Suction Level

1. General: This loop shall provide for monitoring of the pump suction level. When the suction water level drops below the setting of the electrode, the pump running in either Hand or Auto mode shall be shutdown.
2. Control:
   a. Local (At Pump)
      • Pump electrode LE202.
   b. Local (At PSCP).
      • Level relay LR202.
      • Auxiliary relay CR202.
   c. At SCS – None

3. Monitoring:
   a. Local
      • A Pump Low Suction Level Shutdown alarm LLA202A shall be displayed at operator display panel.
   b. At SCS
      • Pump Low Suction Level Shutdown alarm LLA202B.

AA. Loop 203 – Pump P2 Pressure

1. General: This loop shall monitor pump discharge pressure.

2. Control:
   a. Local: The pressure switch PS203 shall be activated when the pressure increases above a preset value. Closure of the switch normally open (NO) contact shall provide input to RTU/PLC.
   b. At SCS – None

3. Monitoring: If the pump does not develop required pressure (settings at PS203 switch) in a pre-selected time, the PLC logic shall set Pump Fail Alarm PSA203.
   a. Local
      • Pump Fail Alarm XLA203A shall be displayed at the operator display panel.
   b. At SCS
      • Pump Fail Alarm XLA203B.
BB. Loop 204 – Pump Control Valve

1. General: This loop shall control operation of the pump control valve. The valve shall be opened after the pump is running and developing sufficient pressure (monitored by switch PS203). The valve shall be closed before the pump is stopped. A pump discharge valve fail to open alarm will be generated upon discharge valve failure to open. PLC will subsequently shut down the pump whenever the discharge valve fail to open alarm occurs. This alarm will be displayed in SCADA as well.

2. Control:
   
   a. Local – At PSCP
      
      • At PSCP. Opening and closing of the valve shall be accomplished by energizing the valves solenoid SOV204. The valve shall be opened/closed through the action of the CR201, CR203 and CR205 relays. See description of Loops 201 and 203 for details. The opening of the valve shall be monitored by the RTU/PLC logic. The control logic shall provide shutdown alarm XA204A to the pump start/stop control when the valve does not open in a predetermined time.

   b. At SCS – None

3. Monitoring:
   
   a. Local.
      
      • At PSCP. The valve position limit switches ZS204A and ZS204B shall activate RTU/PLC inputs and pilot lights ZSL204A and ZS204B.

      • The Pump Control Valve Fail XA204A signal shall be displayed at the operator display panel.

   b. At SCS
      
      • Valve positions XI204A and XI204B.

      • Pump Control Valve Fail XA204B.

CC. Loop 301 – Fire Pump P3 Control

1. General: This control loop shall provide for control of the Pump P3.

2. Control:
   
   a. Local
      
      • Pump P3 Control. The pump shall have two modes of control,
selected by the position of Hand-Off-Auto selector switch HS301A. It shall not be possible to start the pump neither in Hand mode nor in Auto mode when the selector switch is turned to Off position.

Starting of the Pump: After the pump is started and exerts a proper pressure, the pump control valve will open slowly in order to avoid water hammers.

- Hand Mode: When the selector switch is turned to Hand position, the start/stop relay CR301 shall be energized provided Pump Suction Low Level relay CR302 is not de-energized. The CR301 relay shall energize pump starter and the pump should start.

- Auto Mode: In Auto mode of control, the pump shall be started and stopped by the RTU/PLC logic on remote reservoir level signal. The remote reservoir level signal LIT009 (see Loop 009), transmitted to the local RTU/PLC, shall be compared against pre-determined start setpoints. When the reservoir level drops below a given setpoint for a pre-determined time, the RTU/PLC logic shall call for the fire pump to run. A call signal XY110A, XY110B or XY110C (See Loop 110) shall be generated to the pump selected by the pump sequence logic. The Pump Call relay of the pump (CR301) shall be energized after a pre-determined time. The CR301 relay shall energize pump starter Run relay M301. When the fire pump is started, pumps P1 and P2 shall be shut off (software interlock).

When the fire pump is started, all pumps at Lone Oak pump station, located approximately ¾ mile from the La Granada pump station on Lone Oak Drive, shall also be shut off (software interlock).

Stopping of the Pump

- Hand Mode: When the selector switch HS301A is turned to Off position, the CR301 relay shall be de-energized. The solid state starter Run relay M301 shall be de-energized and the pump motor shall be ramped down to stop.

- Auto Mode: When the controlling reservoir level reaches the pre-set set point, the Pump Call signal shall be removed, the Pump Call relay CR301 shall be de-energized, the starter Run relay MX301 shall be de-energized, and the pump motor shall be ramped down to stop.
Pump Control Shutdowns:

- **Hand Mode:** When in Hand Mode, the pump shall be shut down on Low Suction Level alarm only. See Loop 302.

- **Auto Mode:** In Auto mode of control, the pump should be shut down on the following alarms.
  
  - Pump Station High Discharge Pressure. See Loop 003.
  - Pump Station Power Fail. See Loop 004.
  - Pump Low Suction Level. See Loop 302.
  - Pump Fail. See Loop 303.

b. From SCS

- The PLC logic shall provide for starting and stopping the pump from the SCADA central computer (HS301B), providing that Local H-O-A switch (HS301A) is set to Auto position. When pump P3 is started, “Lone Oak Pump Station” will be shutdown (by software interlock).

3. Monitoring:

a. Local

- At Pump Station Display Panel PSCP

  - Pump Run indication XI301A.
  - Pump Run Hours Totalizer XQ301.
  - Pump Run Hours ETM301.
  - Pump Not in Auto alarm XLA301A.

b. At SCS

  - Pump Run XI301B.
  - Pump Run Hours ETM301B.
  - Pump Not in Auto XLA301B.

DD. Loop 302 – Pump P3 Low Suction Level

1. General: This loop shall provide for monitoring of the pump suction level. When the suction water level drops below the setting of the electrode, the pump running in either Hand or Auto mode shall be shutdown.

2. Control:

a. Local (At Pump)

  - Pump electrode LE302.
b. Local (At PSCP)
   • Level relay LR302.
   • Auxiliary relay CR302.

3. At SCS – None

4. Monitoring:
   a. Local
      • A Pump Low Suction Level Shutdown alarm LLA302A shall be displayed at the operator display panel.
   b. At SCS
      • Pump Low Suction Level Shutdown alarm LLA302B.

EE. Loop 303 – Pump P3 Pressure

1. General: This loop shall monitor pump discharge pressure.

2. Control:
   a. Local: The pressure switch PS303 shall be activated when the pressure increases above a preset value. Closure of the switch normally open (NO) contact shall provide input to the RTU/PLC.
   b. At SCS – None

3. Monitoring: If the pump does not develop required pressure (settings at PS303 switch) in a pre-selected time, the PLC logic shall set Pump Fail alarm PSA303.
   a. Local:
      • Pump Fail alarm XLA303A shall be displayed at the operator display panel.
   b. At SCS
      • Pump Fail alarm XLA303B.

FF. Loop 304 – Pump Control Valve

1. General: This loop shall control operation of the pump control valve. The valve shall be opened after the pump is running and developing sufficient pressure (monitored by switch PS303). The valve shall be closed before the pump is stopped. A pump discharge valve fail to open alarm will be generated upon discharge valve failure to open. PLC will subsequently shut
down the pump whenever the discharge valve fail to open alarm occurs. This alarm will be displayed in SCADA as well.

2. Control:

a. Local – At PSCP
   - At PSCP. Opening and closing of the valve shall be accomplished by energizing the valve’s solenoid SOV304. The valve shall be opened/closed through the action of the CR301, CR303 and CR305 relays. See description of Loops 301, 303 and 305 for details. The opening of the valve shall be monitored by the RTU/PLC logic. The control logic shall provide shutdown alarm XA304A to the pump start/stop control when the valve does not open in a predetermined time.

b. At SCS – None

3. Monitoring:

a. Local
   - At PSCP. The valve position limit switches ZS304A and ZS304B shall activate RTU/PLC inputs and pilot lights ZSL304A and ZS304B.
   - The Pump Control Valve Fail XA304A signal shall be displayed at the operator display panel.

b. At SCS
   - Valve positions ZS304A and ZS304B.
   - Pump Control Valve Fail XA304B.

GG. Loop 401 – Pump Station Discharge Pressure

1. General: This loop continuously monitors pump station discharge pressure. This is only a monitoring loop, not control loop.

2. Control: None

3. Monitoring:

a. Local
   - Pressure transmitter PT401.
   - Pressure indication PI401

b. At PSCP
   - The pressure signal shall be provided to the pump station RTU/PLC
The pressure value (PI401A) shall be displayed at the pump station display panel (PSCP).

c. At SCS
   - Pressure value (PI401B) shall be displayed at the operator display panel.

d. At Supervisory Control Station (SCS)
   - Pump station flow FI001B.
   - Total flow FQ001B.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install a complete SCADA system for the project as specified herein and as required to complete the work.

B. The SCADA system shall include the following, but not limited to:

1. Hardware which shall include a remote terminal unit (RTU), a human machine interface (HMI), PLC cabinet, and a workstation at the SCADA Supervisory Control Station (SCS).

2. Software for the remote terminal unit (RTU), human machine interface (HMI), and workstation at SCS.

3. Communications and protocols for the remote terminal unit (RTU), human machine interface (HMI) and workstation at SCS.

4. Testing and commissioning the SCADA system.

C. The Contractor shall coordinate with Northern Digital Inc. (NDI), City’s SCADA Integrator, for the following.

1. NDI will perform review of SCADA system related submittals, witness PLC panel factory acceptance test, inspect Contractor’s installation and field testing.

2. The NDI will perform post construction integration service.

1.02 RELATED WORKS

A. Electrical General Provisions are included in Section 16 00 00.

B. Wires and Cables are included in Section 16 12 00.

C. Control Cabinet and Controls are included in Section 16 90 00.

D. Field Instrumentation is included in Section 17 40 00.
E. Control Loop Descriptions are included in Section 17 41 00.

1.03 REFERENCES

A. NEMA ICS 1 - General Standards for Industrial Control and Systems
B. NEMA ICS 3 - Industrial Systems
C. NEMA ICS 6 - Enclosures for Industrial Controls and Systems
D. NFPA 70 - National Electrical Code

1.04 SUBMITTALS

A. Submit SCS workstation hardware and software for RTU, HMI and workstation.

B. Shop Drawings: Indicate electrical characteristics and connection requirements, including layout of completed assemblies, interconnecting cabling, dimensions, weights, and external power requirements. Also include panel drawings, HMI screenshots, loop drawings, Power Wiring Diagrams and FAT procedures. The loop drawings in addition to showing definitive diagrams for every instrumentation loop system, shall at a minimum meet the following requirements:

1. Show and identify each component of each loop or system using requirements and symbols from ISA 5.4.

2. In addition to the ISA 5.4 requirements, show the following details:

   • Functional name of each loop.
   • Reference name, drawing, and loop diagram numbers for any signal continuing off the loop diagram sheet.
   • Show all terminal numbers, regardless of the entity providing the equipment.
   • MCC panel, circuit, and breaker numbers for all power feeds to the loops and instrumentation.
   • Designation of and, if appropriate, terminal assignments associated with, every manhole, pull-box, junction box, conduit, and panel through which the loop circuits pass.
• If applicable, show vendor control panel, instrument panel, conduit, junction box, equipment, termination identification, wire numbers and colors, power circuits, and ground identifications.

• If a circuit is continued on another drawing, show the name and number of the continuation drawing on the loop drawing. Provide complete references to all continuation drawings whether vendor control panels, other loop drawings, etc.

3. A sample loop drawing is provided in Appendix E of the Specifications for schematic and guideline purposes only and does not alleviate the contractor from meeting the requirements of ISA 5.4.

C. Product Data: Provide data for each component specified showing electrical characteristics and connection requirements.

D. Manufacturer’s Installation Instructions: Indicate application conditions and limitations of use stipulated by the Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of the Product.

1.05 OPERATION AND MAINTENANCE MANUALS

A. Prior to final acceptance of the system, operating and maintenance manuals covering instructions and maintenance on each type of equipment shall be furnished and approved by the Engineer as noted herein. Prior to training, these manuals must be submitted and approved except for record documentation to be inserted by the Contractor upon final submitted approval.

B. The three (3) volume instruction manuals shall be identified by volume and title and bound in three-ring binders with drawings reduced, if details are clearly identified (to no less than 11” x 17”), or folded for inclusion and shall provide at least the following as a minimum:

1. A comprehensive index.

2. A complete set of "RECORD" shop drawings.

3. A complete list of the equipment supplied, including ranges, and pertinent data.

4. Full specifications on each item.

5. System schematic "RECORD" drawings, illustrating all components and electrical connections of the completed system.
6. Detailed service, maintenance, and operation instructions for each item supplied drawings and instructions.

7. Complete parts lists with stock numbers and name, address, and telephone number of the local suppliers.

C. Control System

1. The contractor shall submit the following final documentation prior to final acceptance of the system:

   a. "RECORD" documentation of the completed system.

   b. Hardware maintenance documentation.

   c. Ladder logic programming software maintenance documentation.

2. The final documentation shall be new documentation written specifically for this project but may include standard and modified standard documentation. All standard documentation furnished shall have all portions that apply clearly indicated. All portions that do not apply shall be lined out.

3. The manuals shall contain all illustrations, detailed drawings, wiring diagrams, and instructions necessary for installing, operating, and maintaining the equipment. The illustrated parts shall be numbered for identification. All information contained therein shall apply specifically to the equipment furnished and shall only include instructions that are applicable.

4. If any documentation or other technical information is provided which is considered proprietary, such information shall be designated as such. Documentation or technical information which is designated as being proprietary will be used only for the design, construction, operation, or maintenance of the System and, to the extent permitted by law, will not be published or otherwise disclosed.

5. The requirements for the final documentation are as follows:

   a. "RECORD" documentation shall include all previous submittals, as described in this Specification, updated to reflect the as-built System. Any modifications to the System resulting from the Factory and/or Field Acceptance Tests shall be incorporated in this documentation.

   b. The Hardware Maintenance Documentation shall describe the detailed preventive and corrective procedures required to keep the system in good operating condition. Within the complete Hardware Maintenance Documentation, all hardware maintenance manuals shall make reference to appropriate diagnostics, where applicable, and all
necessary timing diagrams shall be included. A maintenance manual or a set of manuals shall be furnished for all delivered hardware, including peripherals. The Hardware Maintenance Documentation shall include, as a minimum, the following information:

1) Operation Information - This information shall include a detailed description of how the equipment operates and a block diagram illustrating each major assembly in the equipment.

2) Preventive Maintenance Instructions - These instructions shall include all applicable visual examinations, hardware testing and diagnostic routines, and the adjustments necessary for the periodic preventative maintenance of the System.

3) Corrective Maintenance Instructions - These instructions shall include guides for locating malfunctions down to the card replacement level. These guides shall include adequate details for quickly and efficiently locating the cause of an equipment malfunction and shall state the probable source(s) of trouble, the symptoms, probable cause, and instructions forremedying the malfunction.

c. The programming software maintenance documentation shall provide a detailed description of the entire operator interface programming software system. This documentation shall be sufficient for maintenance and modification of the ladder logic programming software system. The following items shall be included in the Software Maintenance documentation:

1) Operating System Reference and User's Manuals – The manuals provided by the PLC manufacturer for programming.

2) User Manuals - All applicable ladder logic diagrams developed for the applications shall be provided.

3) The programming software system shall be fully documented and commented. Two (2) sets of program listings hard copy and on disk shall be provided.

4) A descriptive I/O list, timer, Allen-Bradley ethernet communications, database, and setpoint listing shall be included.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with a minimum of ten years documented experience.
B. Supplier: Authorized distributor of specified manufacturer with minimum five years documented experience.

C. Installer: Authorized installer and system integrator for manufacturer of PLC and operating software with minimum of three years documentation experience with the installation of the PLC and programming software specified. Installer must have a minimum of ten years' experience as a systems integrator. System Integrator must be a U.L. listed shop and have engineering capabilities to provide drawing documentation of installed system.

D. Integrator: Contractor shall provide a qualified integrator and provide a complete functional system. The system integrator shall have the following qualifications:

- Qualification following contract award via the Submittal Process.
- Minimum of 5 years of documented experience with the equipment specified as well as overall systems responsibility for systems of similar size and complexity.
- Experience in performing similar successful projects (equipment type, software type, system integrator responsibilities, complexity).
- Experience with field instrument specification, calibration, installation, testing and system start-up.
- Experience with presenting the information on field instruments and control panel components (specification sheets, ISA sheets, etc.) in a submittal format.
- The Systems Integrator must have a qualified permanent service facility. Panel fabrication and staging facilities adequate to provide services for this project. Panel shop shall be UL508 recognized to produce panels to UL508 standards and labeling.
- System Integrator shall at a minimum be Inductive Automation Ignition version 8.0 Software certified.
- System Integrator shall be Wonderware System Platform Certified
- System Integrator shall have adept knowledge and a proven track record of extensive PLC programming capabilities with Rockwell Automation ControlLogix and CompactLogix PLC programming software platform utilizing Add-On instructions (AOIs) and user defined tags structure with object-oriented programming concepts and methods.
• System Integrator shall be within 150-mile radius from the City of Thousand Oaks.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish Products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 65 00.

B. Accept products on site in factory containers. Inspect for damage.

C. Store products in clean, dry area; maintain temperature to NEMA ICS 1.

1.09 MAINTENANCE SERVICE

Furnish service and maintenance of SCADA system for one year from Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 REMOTE TERMINAL UNIT (RTU)

RTU shall be in accordance with Section 16 90 00.

2.02 HUMAN MACHINE INTERFACE (HMI)

HMI is included in Section 16 90 00.

2.03 COMMUNICATIONS

A. Phone company will provide multimode fiber optic cable terminated at the terminal box outside the building. The Contractor shall provide an adaptor for communication with the PLC. The Contractor shall coordinate with utility company (Frontier) for the Fiber optic cable, terminations and patch panel installations.

Ethernet TCP/IP protocols shall be used as communication protocol between RTU, HMI and workstation at SCS.
2.04 SOFTWARE

Ignition by Inductive Automation. The following shall be included in the Ignition Platform:

- Ignition Designer
- Web Server
- Licensing
- Internal Database
- Database Connectivity
- Module API
- OPC-UA Client
- Authentication
- Auditing
- Redundancy
- System Logging
- Store & Forward
- Basic Alarming Functionality

A. Workstation Software at SCS:

Ignition by Inductive Automation. This software will be purchased by the City under a separate SCADA Upgrade Project.

B. HMI software (Remote Site):

- Ignition

Graphics in Ignition:

1. Main Graphic / System Plan
2. Process Overviews
3. Unit Operations
4. Utilities and Miscellaneous Systems – power monitoring and other miscellaneous systems
5. Control Popups
6. Hydraulic Profile Overview: Overview of zones in City water system and respective elevations. Include general dynamic status (pumps running and zone pressures) on this screen.
7. SCADA System Communications.
8. SCADA HMI and Network Diagnostics.
9. SCADA PLC Diagnostics:

   a. Navigation Bars
   b. Main Menu Bar
   c. Alarm Summary
   d. Trend Displays. Include up to 10 combination trends.
2.05 POINT LIST

1. Digital Inputs Pump No. 1
   a. Pump No.1 Valve Open
   b. Pump No.1 Valve Closed
   c. Pump No.1 Valve Fail
   d. Pump No.1 Fail
   e. "HOA" Selector Switch in Automatic Mode
   f. "HOA" Selector Switch in Hand Mode
   g. Pump No.1 High Discharge Pressure
   h. Pump No.1 Low Suction

2. Digital Inputs Pump No. 2
   a. Pump No.2 Valve Open
   b. Pump No.2 Valve Closed
   c. Pump No.2 Valve Fail
   d. Pump No.2 Fail
   e. "HOA" Selector Switch in Automatic Mode
   f. "HOA" Selector Switch in Hand Mode
   g. Pump No.2 High Discharge Pressure
   h. Pump No.2 Low Suction

3. Digital Inputs Pump No. 3
   a. Pump No.3 Valve Open
   b. Pump No.3 Valve Closed
   c. Pump No.3 Valve Fail
   d. Pump No.3 Fail
   e. "HOA" Selector Switch in Automatic Mode
   f. "HOA" Selector Switch in Hand Mode
   g. Pump No.3 High Discharge Pressure
   h. Pump No.3 Low Suction

4. Digital Inputs – Alarms
   a. Intrusion Alarm - Pump Room
   b. Intrusion Alarm - Generator
   c. Pressure Relief Valve Open
   d. Phase Failure
   e. Generator Run
   f. Transfer Switch in "Normal Power" Position
   g. Transfer Switch in "Emergency Power" Position
   h. SCADA System on UPS Power
5. Digital Inputs Pump Station
   a. Flow Total

6. Digital Outputs Pump Station
   a. Pump No.1 Call
   b. Pump No.2 Call
   c. Pump NO.3 Call

7. Pump Station Analog Inputs
   a. Pump Station Discharge Flow Rate
   b. Pump Station Discharge Pressure
   c. Pump Station KW
   d. Pump Station KVARar

8. Ethernet I/O
   a. Multi-function Display Panel Input
   b. Power Monitor Output

9. Digital Inputs Reservoir
   a. Outlet Valve Open
   b. Outlet Valve Closed
   c. Seismic control system activated
   d. Seismic control system malfunctioning alarm

10. Analog Inputs Reservoir
    a. Tank Water Level Transmitter
    b. Reservoir Outlet Flow

11. Digital Inputs Surge Tank
    a. Low tank level
    b. High tank level

12. Digital Inputs ATS
    a. Normal
    b. Emergency
13. Digital Inputs Generator, Alarms
   a. Running
   b. General Alarm
   c. Warning Alarm

14. Additional Items
   a. Additional items shown on the drawings and in Section 17 41 00.

PART 3 - EXECUTION

3.01 EQUIPMENT INSTALLATION

A. General

   1. The System Integrator shall be responsible for the configuration of the
      SCADA system equipment and auxiliary equipment required for proper
      operation of the specified systems and equipment.

   2. The electrical installations and equipment shall comply with applicable
      codes and standards.

3.02 FIELD WIRING

A. General

   1. The Electrical Contractor shall be responsible for providing all conduit,
      wiring and connections for a complete and operable system.

   2. The Electrical Contractor, in coordination with the System Integrator, shall
      furnish, install, connect, test and place in satisfactory operating condition
      and ready for service, all cable and wire required for connection to all
      indicated control and instrumentation devices.

3.03 TEST PROCEDURES

A. Factory Performance Test

   1. Prior to shipment, the SCADA system shall be demonstrated to perform as
      a system in accordance with the requirements of the Contract Documents.
      The performance test may be witnessed by the Engineer and/or the City.

   2. Two (2) weeks prior to the test, detailed test procedures shall be submitted
      and approved by the Engineer. These procedures shall include a check-off
      list of all hardware I/O, communicated I/O, step-by-step controls to include
all control scenarios specified. This test procedure shall include all SCADA systems individually.

3. The factory performance test shall be scheduled with the Engineer two (2) weeks prior to the requested test date.

4. All input/output signals shall be functionally demonstrated. The Contractor shall provide dummy inputs to represent live data inputs and appropriate meters or other devices to represent output control and/or indicating equipment and as needed for demonstration of control scenarios.

5. The executed check-off list shall be submitted to the Engineer for review and approval.

B. Final Test Operation

1. All control system and I/O point testing shall be completed by the Contractor prior to the operational test starting.

2. Two (2) weeks prior to the test, detailed test procedures shall be submitted and approved by the Engineer. These procedures shall include a check-off list of all hardware I/O, communicated I/O, step-by-step controls to include all control scenarios specified. This test procedure shall include all sites individually.

3. All input/output signals shall be functionally demonstrated. The Contractor shall utilize live data inputs and dummy inputs, when necessary, to perform all functionality requirements of the final test operation.

4. Upon successful completion of the test procedures check-off list, the System shall be set to "auto" and operate for five (5) working days. Any defects encountered during this test period shall be immediately corrected and, if deemed necessary by the Engineer, the 5-day test, or relevant parts, shall be repeated.

5. The results of the final operational test shall be approved by the Engineer.

C. Training

1. Training shall consist of hardware maintenance, programming and communications. All training shall include hands-on training and applicable OEM manual familiarization. Training Item 1 shall be performed in coordination with pump stations and tank sites to be put on line. Training Item 2 shall be provided prior to final test operation. All training shall be at a mutually agreeable date with the District. A detailed training outline shall be submitted and approved prior to scheduling any training.
2. Item 1 - Hardware and Maintenance - This training shall consist of familiarization of all hardware, operation of pertinent items and maintenance and care of such items. Also included in this training shall be general operation and use of the control system. This training shall be a minimum of two each four (4) hour sessions as required by the quantity of District personnel to train.

3. Item 2 - Programming and Communications - This training shall consist of familiarization of the operator interface program. This training shall be performed at the new facilities. This training shall be a minimum of eight (8) hours.

3.04 SYSTEM TUNING

A. The Contractor, with assistance and knowledge of the Engineer and/or District, will "tune" the system after the system is on-site for the discretion of the project. Tuning the system shall consist of, but not be limited to, modifying communication parameters, modifying alarm priorities and specifications, and modifying RTU and instrument setpoints for the purpose of improving control and communication efficiencies, reducing or eliminating repetitious and nuisance alarms, and improving trending and report accuracies of the system.

B. The majority of this tuning shall be accomplished prior to the Final Acceptance Test.

3.05 POST CONSTRUCTION COORDINATION WITH NDI

A. NDI will be responsible for integration services including PLC Program Development, Supervisory Control and Data Acquisition (SCADA)/Human Machine Interface (HMI) Program Development, Operator Interface Terminal (OIT) Development, PLC/HMI Factory Acceptance Test, System Commissioning & Startup Services including Loop Checks, System Tuning, As-Built Documentation and Training.

B. The Contractor, in coordination with NDI, shall furnish, install, connect, test and place in satisfactory operating condition and ready for service, all cable and wire required for connection to all indicated control and instrumentation devices. The Contractor shall be responsible for the manufacturing and installation of the PLC control panel.

C. The contractor should be available to rectify, correct, support, etc. during NDI's post construction integration work.

END OF SECTION
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La Granada Reservoir
LA GRANADA RESERVOIR
CITY OF
THOUSAND OAKS, CALIFORNIA
SPEC. 87-8809

OWNER:
CITY OF THOUSAND OAKS
401 W. HILLCREST DR.
THOUSAND OAKS, CALIFORNIA
91360

DEVELOPER:
PERLITER & INGALSBE CONSULTING ENGINEERS
1461 EAST CHEVY CHASE DR.
GLENDALE, CALIFORNIA
91206

LEE NEUMANN & ASSOCIATES, INC.
31320 VIA COLINAS SUITE 108 WESTLAKE VILLAGE, CALIFORNIA 91362-3962

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"AS-BUILT" 3-7-90

NOTICE OF COMPLETION:
DOC# 01-192856
9/06/99
FILE: DR- 86-340
GENERAL NOTES

A GENERAL

1. All construction shall conform to the City of Thousand Oaks Public Works Department Water Design and Construction Standards adopted September 28, 1987, as amended and in accordance with the Contract Documents.

2. All work shall conform to contract documents and the applicable construction standards, unless a change order is approved in writing by the Public Works Department Engineer.

3. Where conflicts occur between requirements of design standards, codes and Contract Documents, the most stringent requirements, as determined by the Engineer, shall apply.

4. Where reference is made to various test standards for materials or processes, such standards shall be the latest edition, and/or addition.

5. Contractor shall possess a valid California Contractor’s license as shown on the Notice Inviting Bids.

6. Contractor shall obtain and pay for a City of Thousand Oaks business license.

7. Contractor shall apply for and obtain all required permits from the City of Thousand Oaks. No fees will be charged to the Contractor for permits issued by the City for this project.

8. Reference letters and numbers shown to circles are detail identification symbols. See Reference 1.1.2 in Section 13 or Section 9 as referred on Sheet 1.5. Symbol 1.1.2 means Detail 1 on the same sheet.

9. Dimensional distances shall govern over scaled distances.

10. Drawings may not show all or any existing vegetation for clarity.

11. Unless otherwise noted, all work shown in these documents is new and to be performed under this Contract.

12. Unless otherwise noted or approved in writing by the Owner, the components shall be same in type, style, color, finish and manufacture throughout the project with different sizes and characteristics as required.

B NOTIFICATION AND COORDINATION

1. Contractor shall submit request to the City of Thousand Oaks at least 7 days in advance for installation of City facilities required for construction.

2. The Underground Service Alert (USA) shall be notified at 811 at least two (2) working days before performing any excavation work to alert utility owners to the underground utilities. USA ticket numbers shall be kept current in accordance with 811 72.

C EXISTING FACILITIES

1. The details and dimensions of all existing facilities, elevations and dimensions in the field prior to fabrication of new materials and/or equipment. Such verification shall include photos for existing pipe and conduits.

2. Existing utilities shall be maintained in place and operational during construction unless otherwise shown or approved in writing by the Owner.

3. Service laterals from water, gas, sewer, telephone, cable TV, electrical, etc. may not be shown on the plans; however, they do not exempt those services laterals from these utilities do not exist. Contact the utility companies for specific information.

4. Contractor to locate, protect, and repair at his expense, any utilities damaged by his forces.

5. Contractor shall maintain access to and around the existing City facilities at all times, unless otherwise approved in writing by the Owner.

6. Unless otherwise approved in writing by the Owner or noted elsewhere in the Contract Documents, modifications to the existing piping shall be performed within 6 hours.

D DRAINAGE AND DITCHING

1. All trench backfill and compaction will be inspected by the City of Thousand Oaks Public Works Department.

2. Steel pipe and fittings shall be standard weight proved end or butt weld type except as otherwise noted.

3. Flanges shall be ANSI Class 150, unless otherwise shown.

4. Pipe installed above ground and inside structures shall be mortar lined and pointed in accordance with the Specifications.

5. All buried steel pipe shall be mortar lined and coated in accordance with the Specifications.

6. Not all pipe markings or appearances may be called out or shown but are required to be provided by the Contractor to provide a complete piping system.

E ELECTRICAL

1. Provide conduit wall access around all conduit penetrating walls below grade.

2. Conduct under concrete slab, wall etc. shall stub up as close as possible to the served equipment.

3. Install pull boxes and/or junction boxes for electrical and communication lines as required. Screws shall be all required unless otherwise specified.

F MISCELLANEOUS

1. Color of all pipe shall be approved by the Owner.

2. The Contractor shall remove all water, as required, from the existing pipeline prior to making modifications and/or connections, unless hot-tapped connections are made.

SYMBOLES AND LEGEND

- Property Line
- Lineal
- Guard Post
- Guard Post
- Power Pole
- Manhole
- Valve
- Light Post
- Tree
- Gravel/Granular Material
- Concrete
- Undisturbed Earth

CITY OF THOUSAND OAKS
RESERVOIRS SEISMIC VALVE IMPROVEMENTS
EXISTING SITE LAYOUT PLAN SHOWING NEW CONDUITS

**NOTES:**
1. For meter calibration schedule and limiting flow range, see Sheet 15.
2. Install one 120 VAC, 15A, 1P new circuit breaker at position #2 in the electrical distribution panel for power supply to VPC.
3. Terminate the conductors in existing telemetry cabinets at terminal strip in accordance with the diagram shown on Sheet 14.
4. Drill and weld flanged outlet on existing piping. Provide reinforcement units as per specs.

**PLAN**
- 4" Gate Valve, Trip
- 4" Grooved Cap, Trip
- 1/2" Clamp Conduit
- 4" Grooved Cap, Trip
- 4" Gate Valve, Trip

**SECTION**
- 10" x 12" Nameplate Box for (N) Signal Converter
- 2 x 3/8" T-120
- 4" Elongated Outlet Used in Existing, Trip, See Notes 4 Below
- 4" Electromagnetic Kilometer Tube
- 1" Fitting Conduit
- 4" Grooved Cap, Trip

**VALVE CONTROL MOTOR, FLOW METER, VPC & VCC LOCATION PLAN**

**RECORD DRAWINGS**

**CITY OF THOUSAND OAKS**

**RECEIVED & DRAWING CHECKED**
La Granada Pump Station Area
Utility Data - SCE
La Granada Pump Station Area
Utility Data - Frontier
La Granada Reservoir Inlet-Outlet
Modification/Relocation
Utility Data Tract 5116
La Granada Drive - Waterline Drawings 20088
Waterline Drawing No 20135W
Tract No. 1244
Waterline Drawing No 20161
Tract No. 1585
Waterline Drawing No 20411
Tract No. 4228
APPENDIX A

Record Drawings of Existing Facilities
Project/Drawing Description

La Granada Reservoir

Reservoirs Seismic Valve Improvements CI-4311

La Granada Pump Station Area Utility Data - SCE

La Granada Pump Station Area Utility Data - Frontier-Verizon

La Granada Reservoir Inlet-Outlet Modification/Relocation - Utility Data - Water - Tract 5116

La Granada Drive Waterline Drawing No. 20088

Waterline Drawing No. 20135W – Tract 1244

Waterline Drawing No. 20161 - Tract 1585

Waterline Drawing No. 20331 – Tract 3204

Waterline Drawing No. 20411 – Tract 4228

(Contractor to coordinate with the City for additional record information if available and not included in Appendix A)
WATER

Design and Construction Standards

THOUSAND OAKS

City of Thousand Oaks
Public Works Department
2100 Thousand Oaks Boulevard
Thousand Oaks, California 91360
(805) 449-2400

JUNE 23, 2009
NO MORE THAN 4' OF THE EXISTING PIPE SHALL BE EXPOSED

EXISTING WATER, STORM DRAIN OR OTHER UTILITY, EXCLUDING WASTEWATER

SPRINGLINE

10 mil POLYETHYLENE PLASTIC WRAP

PROPOSED WATER

CEMENT/SAND SLURRY BACKFILL

TRENCH BOTTOM

NOTES:

1. MINIMUM SEPARATION BETWEEN CROSSING FACILITIES IS 12". PRIOR TO DEVIATION OF THIS REQUIREMENT AND THE USE OF THIS PLATE, SPECIAL PERMISSION FROM THE CITY OF THOUSAND OAKS AND THE OWNER OF THE EXISTING PIPELINE IS REQUIRED.

2. WHEN A WATERLINE CROSSES A WASTEWATER LINE, SEPARATION REQUIREMENTS SHALL BE DETERMINED BY THE CALIFORNIA DEPARTMENT OF PUBLIC HEALTH GUIDELINES.

3. PIPE SECTIONS SHALL BE CENTERED AT THE CROSSING IN ORDER TO MAINTAIN MAXIMUM DISTANCE FROM CROSSING TO THE PIPE JOINTS.
NOTES:

1. MINIMUM SEPARATION BETWEEN CROSSING FACILITIES IS 12". PRIOR TO DEVIATION OF THIS REQUIREMENT AND THE USE OF THIS PLATE, SPECIAL PERMISSION FROM THE CITY OF THOUSAND OAKS AND THE OWNER OF THE EXISTING PIPELINE IS REQUIRED.

2. WHEN A WATERLINE CROSSES A WASTEWATER LINE, SEPARATION REQUIREMENTS SHALL BE DETERMINED BY THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES GUIDELINES.

3. PIPE SECTIONS SHALL BE CENTERED AT THE CROSSING IN ORDER TO MAINTAIN MAXIMUM DISTANCE FROM CROSSING TO THE PIPE JOINTS.
NOTE:

1. VALVE OPERATING NUTS SHALL NOT BE GREATER THAN 4.5' BELOW THE FINISHED SURFACE. EXTENSION STEMS WITH ROCK SHIELDS SHALL BE PROVIDED WHERE DEPTHS EXCEED 4.5'. TOP OF EXTENSION SHALL BE A MINIMUM OF 1' AND A MAXIMUM OF 3' BELOW THE FINISHED SURFACE. EXTENSION STEM SHALL NOT EXCEED 5' IN LENGTH.

2. FOR VALVES LOCATED IN CONCRETE DRIVES, SIDEWALKS, OR LANDSCAPING A CHRISTY G3 VALVE BOX COVER SHALL BE USED.

3. VALVE BOXES SHALL NOT BE LOCATED IN CROSS GUTTERS OR FLOWLINES.

CITY OF THOUSAND OAKS
PUBLIC WORKS DEPARTMENT

PLATE NO. 33-1

VALVE BOX INSTALLATION

APPROVED 6/10/09
CITY ENGINEER
FINISH SURFACE

METER BOX

FINISH SURFACE

VALVE BOX

TRACING WIRE

MAIN

2" GATE VALVE

2" BRASS SERVICE SADDLE

2" BALL VALVE WITH BRASS PLUG

90° SWEAT ELBOW

2" COPPER

INSTALL SADDLE AS SHOWN ON PLATE 33-4 FOR AIR/VAC INSTALLATION

END OF MAIN LOCATION

PLAN VIEW

CITY OF THOUSAND OAKS
PUBLIC WORKS DEPARTMENT

PLATE NO. 33-2

2" BLOW-OFF INSTALLATION

APPROVED
CITY ENGINEER
DATE
2" BALL VALVE
WITH BRASS PLUG
METER BOX
FINISH SURFACE

TRACING WIRE
MAINLINE TEE W/ FLANGED OUTLET
VALVE BOX AND EXTENSION STEM
4" FLGxMJ GATE VALVE
COUPLING OR JOINT
4" PVC C900 CL. 200 PIPE
6'-8" MIN.

THRUST/ANCHOR BLOCK
FINISH SURFACE

THRUST BLOCK

CITY OF THOUSAND OAKS
PUBLIC WORKS DEPARTMENT

4" BLOW-OFF INSTALLATION

PLATE NO. 33-3

APPROVED
CITY ENGINEER
DATE 6/10/09
2" COMBINATION AIR RELEASE AND VACUUM VALVE ASSEMBLY

1" COMBINATION AIR RELEASE AND VACUUM VALVE ASSEMBLY

CONNECTION AT HIGH POINT ON WATER MAIN

NOTES:

1. SERVICE LINE TO BE INSTALLED AS SHOWN ON PLATES 36-2 AND 36-4.

2. ASSEMBLIES IN UN-PROTECTED AREAS REQUIRE GUARD POSTS.

3. 2" ASSEMBLY REQUIRED FOR END OF MAIN LOCATIONS AND SHALL BE AT THE LOCATION AS SHOWN ON PLATE 33-2.
NOTE:

1. TAPPING SLEEVE SHALL HAVE A MINIMUM CLEARANCE OF 18" FROM ANY COUPLING, SERVICE SADDLE, OR JOINT ON THE EXISTING MAINLINE.
FIRE HYDRANT SHALL BE A 6" WET BARREL TYPE. OUTLET CONFIGURATION SHALL BE AS DETERMINED BY THE VENTURA COUNTY FIRE PROTECTION DISTRICT.

2. FIRE HYDRANT OUTLETS SHALL BE POINTED TOWARD STREET, OR MAIN DRIVEWAY, OR AS DIRECTED BY VENTURA COUNTY FIRE PROTECTION DISTRICT.

3. FIRE HYDRANT, SPOOL, AND VALVE CAPS SHALL BE PAINTED IN ACCORDANCE WITH SECTION 3-10.

4. FIRE HYDRANTS LOCATED IN UNDEVELOPED AREAS, OR WHERE STREETS ARE WITHOUT CURBS SHALL BE PROTECTED WITH GUARD POSTS.

5. FOR FIRE HYDRANTS BEING USED AS BLOWOFFS, CONNECT TO MAIN PER PLATE NO. 33-3.

6. A CHECK VALVE SHALL BE INSTALLED FOR APPLICATIONS REQUIRING A BREAK OFF CHECK VALVE.
NOTE:

1. FOR GUARD POSTS USED TO PROTECT FIRE HYDRANTS, A CLEAR AREA IS REQUIRED TO PROVIDE CLEARANCE FOR OUTLETS.

2. THE LOCATION OF GUARD POSTS USED TO PROTECT FIRE HYDRANTS SHALL HAVE VENTURA COUNTY FIRE PROTECTION APPROVAL.

3. UNLESS OTHERWISE APPROVED, GUARD POSTS SHALL BE PAINTED THE SAME COLOR AS FIRE HYDRANTS.
NOTES:
1. FOR ANCHOR BLOCK DIMENSIONS AND REBAR SIZE SEE PLATE NO. 35-3.
2. ANCHOR BLOCKS SHALL BEAR ON UNDISTURBED EARTH.
3. SPECIAL DESIGN REQUIRED FOR VERTICAL ANGLES GREATER THAN 22-1/2°.
4. FITTINGS SHALL BE MECHANICAL JOINT OR FLANGE. PUSH JOINT FITTINGS ARE NOT ALLOWED.

CITY OF THOUSAND OAKS
PUBLIC WORKS DEPARTMENT

ANCHOR BLOCKS FOR VALVES AND FITTINGS
VERTICAL ELBOW
$\Delta = 45^\circ, 22-1/2^\circ, 11-1/4^\circ$

NOTES:
1. THRUST BLOCKS SHALL BEAR ON UNDISTURBED EARTH.
2. FOR SIZES AND DIMENSIONS OF THRUST BLOCKS AND REBAR SEE PLATE NO. 35-3.
3. SPECIAL DESIGN REQUIRED FOR VERTICAL ANGLES GREATER THAN 45°.
4. CONCRETE TO EXTEND MIN. 12" ABOVE AND 6" BELOW PIPE INTO UNDISTURBED EARTH.
### BEARING AREA IN SQUARE FEET

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<th>PVC PIPE CLASS</th>
<th>HORIZONTAL ELBOW</th>
<th>CAPPED END OR TEE</th>
<th>REDUCER</th>
<th>REBAR</th>
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<td>23</td>
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### THRUST BLOCK SIZES

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<th>VERTICAL ELBOW</th>
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<td>5'-6&quot; 24&quot;</td>
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### ANCHOR BLOCK SIZES

**NOTE:**

1. ALL EXPOSED REBAR SHALL BE COATED WITH BITUMASTIC COAL TAR EPOXY COATING.
APPENDIX B

City Water Standards

Only select sheets are included here. Refer to complete City’s Standards, which can be accessed by using the following address:

ROAD DESIGN AND CONSTRUCTION STANDARDS
AND
STANDARD LAND DEVELOPMENT SPECIFICATIONS

CITY OF THOUSAND OAKS
PUBLIC WORKS DEPARTMENT
2100 THOUSAND OAKS BOULEVARD
THOUSAND OAKS, CALIFORNIA 91362
(805) 449-2400
www.toaks.org/roadstandards

MAY 15, 2018
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**CITY COUNCIL RESOLUTION NO. 2018 - 024 (MAY 15, 2018)**

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---

**CHANGE** | **DESCRIPTION** | **DATE** | **INITIAL** | **APPROVED:**
--- | --- | --- | --- | ---

---

**CITY OF THOUSAND OAKS**
**PUBLIC WORKS DEPARTMENT**
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PLATE NO. 8-22 STANDARD UTILITY COVER ADJUSTMENT SPECIFICATIONS
PLATE NO. 8-23 STANDARD BUS STOP SINGLE/DUAL SEAT INSTALLATION ON EXISTING CONCRETE
PLATE NO. 8-24 STANDARD BUS STOP SINGLE/DUAL SEAT INSTALLATION ADJACENT TO EX. CONCRETE OR REMOTE LOCATION
PLATE NO. 8-25 STANDARD BUS STOP SINGLE SEAT DETAIL AND SEAT GENERAL INSTALLATION INSTRUCTIONS
3.10. DEVELOPER SHALL SUBMIT ROADWAY PLAN AND PROFILE SIGHT DISTANCE PLANS PREPARED BY A REGISTERED CIVIL OR TRAFFIC ENGINEER DEMONSTRATING COMPLIANCE WITH ALL SSD AND CORNER SIGHT DISTANCE REQUIREMENTS AT THE LOCATIONS DETERMINED BY THE CITY ENGINEER. SUBMITTAL SHALL TAKE INTO CONSIDERATION ON-SITE GRADING, FINAL SLOPES, STREET FURNITURE STRUCTURE, WALLS, FENCES AND MATURE LANDSCAPING. MAXIMUM ANTICIPATED OPERATING VEHICLE SPEED SHALL BE USED IF GREATER THAN ROAD DESIGN SPEED TO DETERMINE MINIMUM SIGHT DISTANCES. SIGHT DISTANCE EASEMENTS AND/OR DEED RESTRICTIONS MAY BE REQUIRED.

4. ASPHALT SURFACING

4.1. ALL A.C. SURFACING 3" OR GREATER IN THICKNESS SHALL BE CONSTRUCTED IN TWO COURSES, ONE BASE COURSE AND ONE SURFACE COURSE. THE SURFACE COURSE SHALL BE A MINIMUM THICKNESS OF 1\(\frac{1}{2}\)". CORE-DRILLED SAMPLES OF THE FINISHED A.C. SECTION SHALL BE PROVIDED BY THE DEVELOPER'S ENGINEER AS DIRECTED BY THE PUBLIC WORKS INSPECTOR. WITHIN PRIVATE PROPERTIES, THE APPLICANT MAY SUBMIT A REQUEST TO HAVE ONE A.C. COURSE UP TO 3" THICK FOR THE REVIEW AND APPROVAL OF THE CITY ENGINEER OR ITS DESIGNEE. IT IS NOTED THAT A.C. MIXTURES C3, D, E AND F CANNOT BE USED IN A SINGLE LIFT, PURSUANT TO TABLE 302-5.5 OF THE "GREENBOOK", LATEST EDITION.

4.2. A.C. PAVEMENT BASE COURSE SHALL BE TYPE III-B-PG 64-10 OR TYPE III-B2-PG64-10 (3/4") AND SURFACE COURSE TYPE III-C2-PG 64-10 (1/2") PER THE 2018 EDITION OF SSPWC 203-6. FOR PRIVATE PARKING LOTS, ALTERNATIVE A.C. PAVEMENT MAY BE CONSIDERED FOR APPROVAL BY THE CITY ENGINEER.

4.3. A.C. PAVEMENT STRUCTURAL SECTION THICKNESS SHALL BE 3" MINIMUM A.C. OVER 6" MINIMUM AB PER TOMC 9-4.2405(a)(1). THICKER STRUCTURAL SECTIONS SHALL BE CONSTRUCTED AS DETERMINED BY THE SOILS ENGINEER, BASED ON IN-SITU SUBGRADE R-VALUE AND THE SPECIFIED TRAFFIC INDEX. ALTERNATIVE EQUIVALENT SECTIONS MAY BE APPROVED BY THE CITY ENGINEER.

4.4. A.C. PAVEMENT SHALL BE PLACED IN ACCORDANCE WITH SSPWC 302-5, AND SHALL BE COMPACTED TO 95% RELATIVE COMPACTION.

4.5. LONGITUDINAL JOINTS SHALL OCCUR WITHIN ONE FOOT OF LANE LINES OR THE CENTER OF A LANE. LONGITUDINAL JOINTS ARE NOT ALLOWED ON WHEEL TRACKS.

4.6. IF APPROVED BY THE CITY ENGINEER, PCC PAVEMENT MAY BE SUBSTITUTED FOR A.C. PAVEMENT ON ALL SECTIONS, AND SHALL BE DESIGNED IN ACCORDANCE WITH THE CALTRANS HIGHWAY DESIGN MANUAL. CONCRETE FOR PCC PAVEMENT SHALL BE 520-C-2500 PER SSPWC 201-1.

4.7. SLURRY SEAL COATS SHALL COMPLY WITH SSPWC 203-5 AND 302-4, TYPE II-RUBBERIZED.

5. CONCRETE AND BASE MATERIALS

5.1. UNLESS OTHERWISE INDICATED, ALL STRUCTURAL CONCRETE (CONCRETE REINFORCED WITH STEEL) SHALL BE 560-C-3250 PER SSPWC 201-1.

5.2. ALL OTHER CONCRETE IMPROVEMENTS (CURBS, GUTTERS, DRIVEWAYS, SIDEWALKS, ETC.) SHALL BE 520-C-2500 PER SSPWC 201-1.

5.3. HIGHER CONCRETE SPECIFICATIONS SHOWN ON PLANS WILL GOVERN.
5.4. CALCIUM CHLORIDE SHALL NOT BE USED IN CONCRETE MIX DESIGNS

5.5. AB AND ASB SHALL BE CAB OR CMB PER SSPWC 200-2. ALTERNATELY, PMB PER SSPWC 200-2 MAY BE USED FOR ASB.

5.6. FOR PUBLIC AND PRIVATE STREET AND PARKING LOT SECTIONS, INCLUDING CURBS AND GUTTERS, THE UPPER 6" OF SUBGRADE AND AB AND ASB SHALL BE COMPACTED TO 95% RELATIVE COMPACTION. FOR SIDEWALKS AND RESIDENTIAL DRIVEWAYS, SUBGRADE AND AB COMPACTION SHALL BE 90%.

6. DRAINAGE DESIGN

6.1. HYDROLOGIC AND HYDRAULIC ANALYSES IN SUPPORT OF DRAINAGE SYSTEM DESIGN SHALL BE PERFORMED IN CONFORMANCE WITH VCWPD STANDARDS.

6.2. ROAD CROSS-SECTIONS MAY BE USED TO CONVEY WATER ORIGINATING ON THE STREET, FROM ADJOINING LOTS, AND FROM ADJACENT UNIMPROVED AREAS, PROVIDED VEHICLE AND PEDESTRIAN USE OF THE ROADS IS NOT UNREASONABLY RESTRICTED, AND ROAD IMPROVEMENTS AND ADJACENT PROPERTIES WILL NOT BE DAMAGED. FLOW FROM UNIMPROVED AREAS SHALL HAVE FACILITIES TO REMOVE SILT AND DEBRIS BEFORE ENTERING THE STREET. THE HYDRAULIC DESIGN SHALL INCLUDE THE EFFECT OF NON-UNIFORM FLOW AT CHANGES IN GRADE, BENDS AND JUNCTIONS OF MULTIPLE STREAMS.

6.3. PEAK STORM RUNOFF THAT HAS A 10% PROBABILITY OF OCCURRENCE (10-YEAR AVERAGE RETURN PERIOD) SHALL BE USED FOR CALCULATING THE CAPACITY OF ROAD DRAINAGE FACILITIES. PEAK STORM RUNOFF THAT HAS A 2% PROBABILITY OF OCCURRENCE (50-YEAR AVERAGE RETURN PERIOD) SHALL BE USED FOR CALCULATING THE CAPACITY OF SUMP AREA DRAINAGE FACILITIES. ALL DRAINAGE FACILITIES SHALL BE DESIGNED SUCH THAT ADJACENT LOT PADS WILL NOT BE FLOODED BY THE STORM RUNOFF THAT HAS A 1% PROBABILITY OF OCCURRENCE (100-YEAR AVERAGE RETURN PERIOD). CONSIDERATION SHALL ALSO BE GIVEN TO FLOODING CAUSED BY PLUGGING OF DRAINAGE FACILITIES.

6.4. TO PREVENT UNDUE INTERFERENCE WITH TRAFFIC ON URBAN ROADS (ANY SECTION WITH CURBS), A PORTION OF THE ROADWAY SHALL BE KEPT FREE OF LONGITUDINALLY FLOWING DRAINAGE WATER DURING THE 10-YEAR STORM AS SHOWN ON THE STANDARD PLATES.

6.5. CROSS-GUTTERS ARE NOT PERMITTED ACROSS PRIMARY AND SECONDARY ROADS. CROSS GUTTERS ARE PERMITTED ON LOCAL RESIDENTIAL STREETS AT CONTROLLED (STOP SIGNS) SIDE STREETS ONLY.

6.6. CONCENTRATED RUNOFF MAY NOT FLOW ACROSS SIDEWALKS. PARKWAY CULVERTS SHALL BE USED.

6.7. MINIMUM STORM DRAIN PIPE SIZE AND MATERIAL:

6.7.1 MINIMUM PIPE SIZES FOR CITY-MAINTAINED STORM DRAINS SHALL BE 24" INSIDE DIAMETER FOR MAINS AND 18" INSIDE DIAMETER FOR LATERALS.

6.7.2 PIPE MATERIAL FOR CITY-MAINTAINED STORM DRAINS SHALL BE RCP WITH A MINIMUM D-LOAD RATING OF 1350-D. DESIGN OF RCP SHALL BE IN ACCORDANCE WITH VCWPD STANDARDS.

6.7.3 SMALLER DIAMETERS AND ALTERNATIVE PIPE MATERIALS FOR PRIVATELY-MAINTAINED DRAINAGE LATERALS MAY BE ALLOWED WITHIN THE PUBLIC R/W AT THE DISCRETION OF THE CITY ENGINEER.
6.7.4 Manholes shall be constructed at major storm drain junctions, pipe diameter changes, and at minimum 500' spacing.

6.8. Storm drain facilities that accept stormwater from public r/w shall be owned and maintained by the city. Debris basins or other drainage improvements on public open space lands shall be maintained by the city or other public agency. Natural drainage courses on public open space lands are not maintained by the city.

6.9. Storm drain facilities to be maintain by the city that cross private property shall be within a storm drain easement, minimum 15' wide. For pipelines larger than 36' diameter or deeper than 10' to invert, the minimum easement width shall be 25'. Access gates and roads shall be provided for maintenance of city facilities on private property.

6.10. Storm drain facilities within private streets (gated communities) or on private property that do not convey storm runoff from public r/w shall be owned and maintained by the hoa or private property owner. Private storm drain laterals shall be connected to the public mainline at manholes. Private laterals may be connected to the back of public catch basins only upon approval of the city engineer. Storm runoff originating from public open space lands that flows onto private property or private streets must be accommodated by the private property owner or hoa.

6.11. Storm drain testing and inspection

6.11.1 Contractor shall thoroughly clean out all storm drain system components prior to final inspection by the city.

6.11.2 Developer shall perform a TV inspection of the interior condition of all storm drain system lines prior to final acceptance. The camera/recording system used shall be specifically designed for TV inspection of underground pipelines and structures. A set of video tapes or DVDs, and accompanying report, shall be provided to the public works inspector for review. The inspector report shall note the precise location and include a detailed description of any and all material and/or workmanship deficiencies. After completion of any needed repairs, a TV re-inspection shall be performed with tape/DVD and report provided per above.

7. Steel plates for open trenches

7.1. Steel plates for all trenches shall be installed per plate nos. 8-18 and 8-19

8. Traffic control

8.1. Traffic control in conformance with plate nos. 8-15 and 8-16 shall be provided for all work performed within city r/w. For other than standard lane closure, a traffic control plan shall be prepared and submitted to the city engineer for approval 72 business hours prior to commencing any work.
8.2. WHENEVER WORK IS BEING PERFORMED ADJACENT TO A LANE CARRYING TRAFFIC OR WITHIN A TRAFFIC LANE, THE EDGE OF LANE OR PAVEMENT SHALL BE DELINEATED BY FURNISHING AND PLACING TEMPORARY PORTABLE DELINEATORS AND SIGNS ADJACENT THERETO IN ACCORDANCE WITH THE CALTRANS "MANUAL OF TRAFFIC CONTROLS FOR CONSTRUCTION AND MAINTENANCE WORK ZONES", CURRENT EDITION.

8.3. HOURS OF CONSTRUCTION WORK ON ARTERIAL OR COLLECTOR STREETS MAY BE LIMITED BY THE CITY ENGINEER (E.G. TO NON-PEAK TRAFFIC HOURS OR LIMITED DAYS DURING HOLIDAY SEASONS).

8.4. TEMPORARY, PLANNED FULL STREET CLOSURES MAY BE ALLOWED UPON APPROVAL BY THE PUBLIC WORKS DIRECTOR. A WRITTEN REQUEST, INCLUDING THE REASON FOR THE CLOSURE AND A TRAFFIC CONTROL AND DETOUR PLAN, MUST BE SUBMITTED FOR REVIEW AND APPROVAL AT LEAST TWO WEEKS PRIOR TO THE START OF THE CLOSURE.

9. TRAFFIC SIGNALS, PAVEMENT MARKERS AND STRIPING

9.1. DESIGN AND CONSTRUCTION OF TRAFFIC STRIPING, PAVEMENT MARKERS, AND TRAFFIC SIGNALS SHALL CONFORM TO SECTIONS 84, 85, AND 86, RESPECTIVELY, OF THE SSS AND AS APPROVED BY THE CITY ENGINEER. TRAFFIC STRIPING PAINT SHALL ALSO CONFORM TO FEDERAL HIGHWAY ADMINISTRATION SPECIFICATIONS PER 23 CFR PART 655.

9.2. SEPARATE TRAFFIC SIGNING AND STRIPING PLAN SHEETS SHALL BE PREPARED AND SUBMITTED FOR REVIEW AND APPROVAL.

10. STREET TREE PLANTING

10.1. STREET TREE PLANTING IS REQUIRED FOR ALL PROJECTS PER TOMC 9-3.1006 UNLESS SPECIFICALLY EXCLUDED BY THE CONDITIONS OF APPROVAL.

10.2. DEVELOPER SHALL SUBMIT PLANS TO THE COMMUNITY DEVELOPMENT DEPARTMENT FOR REVIEW AND APPROVAL. SEE RESOLUTION NO. 2007-116 "GUIDELINES AND STANDARDS FOR LANDSCAPE PLANTING AND IRRIGATION PLANS" FOR SUBMITTAL REQUIREMENTS. PLANS MUST BE APPROVED BY BOTH COMMUNITY DEVELOPMENT AND PUBLIC WORKS DEPARTMENTS PRIOR TO CONSTRUCTION.

10.3. AN ADDITIONAL AMOUNT OF $250.00 (INFLATED PER THE CITY OFF-SITE IMPROVEMENT FEE CALCULATION SHEETS) FOR EACH TREE SHALL BE INCLUDED IN THE SUBDIVISION OR OTHER IMPROVEMENT BONDS.

10.4. TREES SHALL BE PLANTED PRIOR TO OCCUPANCY OF ANY BUILDING. PRIOR TO PLANTING, THE DEVELOPER SHALL MARK THE LOCATIONS FOR STREET TREES AND REQUEST CITY INSPECTION OF NURSERY STOCK AND PLANTING AREAS. THE CITY SHALL HAVE THE RIGHT OF DESTRUCTIVE INSPECTION OF UP TO 2% OF THE PROPOSED PLANTING STOCK BEFORE INSTALLATION.

10.5. TREE SELECTION SHALL BE BASED UPON CONSIDERATION OF THE PLANTING SPACE, ADJACENT USES, ENVIRONMENTAL FACTORS AND EXISTING SPECIES. SPECIES SHALL BE SELECTED PER THE CITY FORESTRY MASTER PLAN.
10.6. TREES SHALL BE A MINIMUM OF 24” BOX AND BE CERTIFIED BY THE NURSERY TO BE TRUE TO APPROVED SPECIES SELECTION. ALL LARGE STONES OR OTHER DEBRIS SHALL BE REMOVED FROM THE PLANTING SOIL. REMOVE NURSERY STAKES FOLLOWING PLANTING.

10.7. STREET TREES SHALL BE PLANTED NOT LESS THAN 40' APART NOR MORE THAN 60' EXCEPT IN INSTANCES WHERE SUCH PLANTING WILL INTERFERE WITH FIRE HYDRANTS, UTILITY POLES, DRIVEWAYS, OR STOPPING SIGHT DISTANCE REQUIREMENTS PER PLATE 3-10. NO TREE SHALL BE PLANTED CLOSER THAN 10' FROM FIRE HYDRANTS OR SEWER LATERALS, 20' FROM LAMP STANDARDS OR EITHER END OF CURB RETURNS AT INTERSECTIONS, AND 5' FROM INTERSECTING WALKS, DRIVEWAYS OR METER BOXES. AT LEAST TWO TREES SHALL BE PLANTED AT CORNER LOTS.

10.8. TREES SHALL BE MAINTAINED AND WATERED BY THE DEVELOPER AS NEEDED UNTIL ACCEPTED BY THE CITY. DEVELOPER SHALL REPLACE TREES FOUND TO BE MISSING, DEAD OR IN POOR HEALTH PRIOR TO PROJECT ACCEPTANCE BY THE CITY.

11. TRENCH CUT REQUIREMENTS

11.1. FOR INSTALLATION OF SMALL UNDERGROUND PIPELINES IN EXISTING CITY STREETS, BORING, JACKING, HORIZONTAL DIRECTIONAL DRILLING OR MICRO-TUNNELING METHODS SHALL BE USED TO THE GREATEST EXTENT PRACTICABLE. THE CITY ENGINEER MAY PERMIT OPEN CUT TRENCHING IF OTHER METHODS ARE DETERMINED TO BE INFEASIBLE (TOMC 7-2.615). ALL TRENCHES IN EXISTING PAVED STREETS SHALL BE BACKFILLED AND REPAVED PER PLATE 8-14.

11.2. MORATORIUM STREETS - A MORATORIUM AGAINST TRENCHING IS IMPOSED IN EXISTING CITY STREETS THAT ARE LESS THAN FIVE YEARS OLD OR HAVE RECEIVED AN A.C. OVERLAY WITHIN THE LAST FIVE YEARS. EXCEPTIONS TO THE MORATORIUM MAY ONLY BE GRANTED BY THE CITY ENGINEER, AND, IF GRANTED, MAY BE SUBJECT TO ADDITIONAL CONDITIONS AS DETERMINED BY THE CITY.

11.3. WHERE MULTIPLE TRENCHES ARE CUT IN ANY STREET, SUCH AS FOR A MAINLINE AND SERVICES SERVICE LATERAL REPLACEMENT PROJECT, OR WHERE A TRENCHING PROJECT RESULTS IN SIGNIFICANT WEAR OR DAMAGE TO THE STREET SURFACE, ADDITIONAL CONDITIONS MAY BE IMPOSED, INCLUDING, BUT NOT LIMITED TO, AN ASPHALT OVERLAY OR APPLICATION OF A SLURRY SEAL OVER THE FULL WIDTH AND LENGTH OF THE AFFECTED STREET.

12. EQUESTRIAN TRAIL/UNPAVED PATH REQUIREMENTS

12.1. MATERIAL USED FOR THE INSTALLATION OF EQUESTRIAN TRAILS AND UNPAVED PATHS SHALL BE SOLIDIFIED DECOMPOSED GRANITE (DG) PER SSPWC 200-2.7. RESIN OR BINDER USED TO SOLIDIFY DG SHALL BE APPROVED BY THE CITY ENGINEER.

13. STORMWATER POLLUTION CONTROL AND BEST MANAGEMENT PRACTICES (BMPs)

13.1. ALL PAVED SURFACES SHALL BE DESIGNED TO CONSIDER AND INCORPORATE PERMANENT RUNOFF REDUCTION AND POLLUTION PREVENTION/TREATMENT BMPs, AS SPECIFIED BY THE CURRENT VENTURA COUNTY NATIONAL POLLUTANT DISCHARGE AND ELIMINATION SYSTEM (NPDES) MUNICIPAL PERMIT. TECHNICAL REFERENCES AND RESOURCES RELATING TO APPLICABILITY AND DESIGN THRESHOLDS ARE AVAILABLE AT THE COUNTYWIDE STORMWATER QUALITY MANAGEMENT PROGRAM WEBSITE, www.VCStormwater.org.
PEDESTRIAN ACCESS
RAMP STANDARDS
NOTES:

1. REFER TO PLATE NO. 5-5 FOR NOTES AND DETAILS.
2. ALL DIMENSIONS, ELEVATIONS, SLOPES AND TRANSITION LENGTHS TO BE DESIGNED BY ENGINEER.
Plan Not to Scale

Section A-A Not to Scale

Notes:
1. Refer to plate no. 5-5 for notes and details.
2. All dimensions, elevations, slopes and transition lengths to be designed by engineer.
ADJUST LOCATION OF RADIUS POINTS SO CURVE WILL BE TANGENT TO R/W LINES AND CURB ON BOTH STREET

NOTES:
1. REFER TO PLATE NO. 5-5 FOR NOTES AND DETAILS.
2. ALL DIMENSIONS, ELEVATIONS, SLOPES AND TRANSITION LENGTHS TO BE DESIGNED BY ENGINEER.
NOTES:
1. REFER TO PLATE NO. 5-5 FOR NOTES AND DETAILS.
2. ALL DIMENSIONS, ELEVATIONS, SLOPES AND TRANSITION LENGTHS TO BE DESIGNED BY ENGINEER.
NOTES FOR ACCESS RAMP STANDARD PLATE NOS. 5-1, 5-2, 5-3 AND 5-4

1. CURB ACCESS RAMPS SHALL BE CONSTRUCTED AT EACH CORNER OF STREET INTERSECTIONS AND WHERE A CROSS WALK OR PEDESTRIAN WAY CROSSES A CURB. TWO RAMPS, CENTERED ON EACH CROSS WALK, SHALL BE PROVIDED AT CURB RETURNS ON PRIMARY, SECONDARY, INDUSTRIAL AND COMMERCIAL ROADS (CURB RADIUS OF 35'). FOR 25' RADIUS CURB RETURNS, ONE RAMP, CENTERED IN THE RETURN, SHALL BE PROVIDED. RAMPS SHALL NOT EXTEND BEYOND THE CURB RETURN BCR OR ECR.

2. RAMPS SHALL BE A MIN. 4' WIDE AND SHALL GENERALLY LIE IN A SINGLE SLOPE PLAN WITH MINIMAL SURFACE WARPING. RAMP SLOPE SHALL BE MAXIMUM 7.5%, WITH CROSS SLOPE OF 1.5% MAXIMUM. LANDINGS SHALL BE 4' BY 4' WITH A MAXIMUM 1.5% SLOPE IN ANY DIRECTION.

3. THE BOTTOM OF ALL RAMPS OR LANDINGS SHALL BE FLUSH WITH THE ADJACENT GUTTER (NO LIP). THE ADJACENT GUTTER SLOPE SHALL BE 5% MAXIMUM.

4. PROVIDE A 12" WIDE GROOVED BORDER AT THE TOP OF EACH RAMP. SEE DETAIL ABOVE FOR DIMENSIONS OF GROOVES. THE FULL WIDTH AND THE LOWER 3' OF RAMPS OR LANDINGS SHALL HAVE A TRUNCATED DOME DETECTABLE WARNING SURFACE. DOMES SHALL BE ALIGNED ON A SQUARE GRID IN THE PREDOMINATE DIRECTION OF TRAVEL.

5. THE DIMENSIONS AND SPACING OF THE TRUNCATED DOME ON THE DETECTABLE WARNING SURFACE SHALL BE IN ACCORDANCE WITH ADA REGULATIONS AND CALTRANS STANDARD PLAN A88A.

6. TRUNCATED DOME PANELS SHALL BE INSET INTO THE CONCRETE. PANELS SHALL NOT BE APPLIED USING ADHESIVE. CONCRETE OR BRICK PAVERS WITH PRECAST TRUNCATED DOMES MAY BE USED.

7. COLOR OF THE DETECTABLE WARNING SURFACE SHALL CONTRAST VISUALLY WITH ADJOINING SURFACES, EITHER LIGHT-ON-DARK, OR DARK-ON-LIGHT. SELECTION OF COLOR SHALL BE APPROVED BY THE CITY ENGINEER PRIOR TO INSTALLATION. BRICK RED COLOR IS PREFERRED.

8. THE DEVELOPER'S ENGINEER SHALL DESIGN EACH CURB ACCESS RAMP, INCLUDING ALL DIMENSIONS, ELEVATIONS, SLOPES AND TRANSITION LENGTHS AS SHOWN ON PLATE NOS. 5-1, 5-2, 5-3 AND 5-4.

9. THE CONCRETE SURFACE OF THE ENTIRE CURB ACCESS RAMP SHALL BE SLIP RESISTANT AND CONTRASTING FROM THE FINISH OF THE ADJACENT SIDEWALK.

10. SAWCUT EXISTING SIDEWALK AT NEAREST SCORE LINE AND CONSTRUCT NEW CONCRETE SIDEWALK EACH SIDE OF CURB ACCESS RAMP PER PLATE NO. 8-3. PROVIDE SIDEWALK EXTENSIONS AS REQUIRED TO MAINTAIN 4' MIN. PATH OF TRAVEL PER PLATE NO. 8-8 OR 8-9.

11. PROVIDE 6" CONCRETE CURB AT END OF RAMP WHERE SIDEWALK DOES NOT CONTINUE.

12. SAWCUT AND REMOVE/REPLACE MIN. 1' OF EXISTING AC PAVEMENT ALONG ENTIRE LENGTH OF ACCESS RAMP. MATCH EXISTING STRUCTURAL SECTION, MIN. 3" AC OVER 6" AB.

13. TRANSITION BOTH SIDES OF RAMP TO MATCH EXISTING SIDEWALK CONDITIONS.

14. ALL UTILITIES WITHIN THE ECR AND BCR MUST BE RAISED TO GRADE.
DRIVEWAY DESIGN STANDARDS
DESIGN CRITERIA:

1. THE MAXIMUM GRADE FOR NEW RESIDENTIAL DRIVEWAYS IS 15%; 7% FOR NEW COMMERCIAL/INDUSTRIAL DRIVEWAYS.
2. A GRADE OF 2% to 3% SHALL BE USED FOR THE FIRST 10' OF DRIVEWAY APPROACH SLOPING TOWARD THE STREET. THE CHANGE IN GRADE THEREAFTER SHALL NOT EXCEED 6% PER 10'.
3. A 10' VERTICAL CURVE SHALL BE USED ON COMMERCIAL/INDUSTRIAL DRIVEWAYS WHERE A CHANGE IN GRADE OF 3% FOR THE FIRST 10' AND 6% FOR THE NEXT 10' IS USED.
4. AN 8% MAXIMUM DOWNWARD OR 12% MAXIMUM UPWARD BREAK OVER ANGLE MAY BE PERMITTED ONLY UNDER SPECIAL CIRCUMSTANCES AS APPROVED BY THE CITY ENGINEER.
5. RESIDENTIAL DRIVEWAYS MAY BE PORTLAND CEMENT CONCRETE OR ASPHALT CONCRETE, AS FOLLOWS:
   A. 4" (5 SACK) PCC ON 4" AB WITH 6x6 #10 WIRE MESH OR #3 REINFORCING BARS AT 24" O.C.
   B. 6" (5 SACK) PCC ON NATIVE SOIL(REINFORCING STEEL OPTIONAL)
   C. 3" AC ON 6" AB
6. A RECIPROCAL ACCESS EASEMENT AND MAINTENANCE AGREEMENT SHALL BE RECORDED WHERE COMMON RESIDENTIAL DRIVEWAYS SERVICE TWO OR MORE LOTS.
7. FOR APPROACHES, SEE PLATE NOS. 6-2, 6-3, 6-4, & 6-5.
8. FOR LIFTS AND COMPACTION OF ASPHALT CONCRETE, SEE PLATES NOS. 1-5 AND 1-6.
NOTES:
1. The total sum of all the driveway widths (W) is limited to 40% of the property frontage (however, one driveway up to 27' is allowed). The minimum distance between the top of side slopes on adjacent driveways on the same lot or parcel is 22' and on adjoining lots or parcels is 1'.
2. Driveways shall be constructed as in Case I where Parkway is 5' wide and where sidewalk abuts curb. Case II shall be used when the Parkway is 10' or greater and where sidewalk does not abut curb.
3. If the Parkway is over 10', the driveway shall be constructed as if the Parkway were 10' wide (Case II).
4. A driveway shall not be constructed or maintained where fence, buildings, natural grade or any other obstacle will prevent a motor vehicle from being stored entirely off the public right-of-way after entering such driveway.
5. A driveway shall not be constructed in the curb return area at intersections nor within 5' of the curb return at either end.
6. Special apron design shall be required by city engineer where curb face height exceeds 8'.
7. Remove and replace adjacent floating pieces of sidewalk less than 4' long.
8. A 4' wide sidewalk easement, extending 5' beyond each end of the driveway, shall be dedicated to the city for Case I conditions.

CITY OF THOUSAND OAKS
PUBLIC WORKS DEPARTMENT
STANDARD RESIDENTIAL DRIVEWAY
PLATE NO. 6-2
NOTES:
1. TO BE USED IN APPROVED LOCATIONS ONLY.
2. MAXIMUM WIDTH (W) OF DRIVEWAY SHALL BE AS FOLLOWS:
   A. LOT FRONTAGE LESS THAN 100': 25'.
   B. LOT FRONTAGE 100' OR MORE: 30' OR 20% OF FRONT FOOTAGE WHICH EVER MAY BE GREATER, BUT NOT TO EXCEED
      A MAXIMUM OF 36' WIDE.
   C. THE TOTAL AGGREGATE WIDTH OF DRIVEWAYS ON ONE LOT OR PARCEL IS LIMITED TO 36% OF THE TOTAL
      FRONTAGE.
3. THE MINIMUM DISTANCE BETWEEN THE TOP OF SIDE SLOPES ON ADJACENT DRIVEWAYS ON THE SAME LOT OR PARCEL
   IS 22' AND ON ADJOINING LOTS OR PARCELS IS 1'.
4. IF THE PARKWAY IS OVER 10', THE DRIVEWAY SHALL BE CONSTRUCTED AS IF THE PARKWAY WAS 10' WIDE (CASE II).
5. A DRIVEWAY SHALL NOT BE CONSTRUCTED OR MAINTAINED WHERE FENCE, BUILDINGS, NATURAL GRADE OR
   ANY OTHER OBSTACLE WILL PREVENT A MOTOR VEHICLE FROM BEING STORED ENTIRELY OFF THE PUBLIC R/W
   AFTER ENTERING SUCH DRIVEWAY.
6. A DRIVEWAY SHALL NOT BE CONSTRUCTED IN THE CURB RETURN AREA OF INTERSECTIONS NOT WITHIN 5' OF
   THE CURB RETURN AT EITHER END.
7. SPECIAL APRON DESIGN SHALL BE REQUIRED BY CITY ENGINEER WHERE CURB FACE HEIGHT EXCEEDS 8".
8. REMOVE AND REPLACE ALL ADJACENT FLOATING PIECES OF SIDEWALK LESS THAN 4' LONG.
9. A 5' WIDE SIDEWALK EASEMENT, EXTENDING 5' BEYOND EACH END OF THE DRIVEWAY, SHALL BE DEDICATED TO
   THE CITY FOR CASE I CONDITIONS.
10. MINIMUM COMMERCIAL DRIVEWAY SPACING SHOULD BE 150 FEET MEASURED FROM DRIVEWAY CENTERLINE TO
    CENTERLINE.
NOTES:
1. MAXIMUM WIDTH (W) OF DRIVEWAY SHALL BE AS FOLLOWS:
   A. LOT FRONTAGE LESS THAN 100': 25'
   B. LOT FRONTAGE 100' OR MORE: 30' OR 20% OF FRONT FOOTAGE WHICHEVER MAY BE GREATER, BUT NOT
      TO EXCEED A MAXIMUM OF 36' WIDE.
   C. THE TOTAL AGGREGATE WIDTH OF DRIVEWAYS ON ONE LOT OR PARCEL IS LIMITED TO 36% OF THE TOTAL
      FRONTAGE
2. THE MINIMUM DISTANCE BETWEEN THE END OF CURB RETURN (ECR) AT THE STREET AND ADJACENT
   PROPERTY LINE IS 1'.
3. DRIVEWAY APPROACH SHALL NOT BE CONSTRUCTED OR MAINTAINED WHERE FENCE, BUILDINGS, NATURAL
   GRADE OR ANY OBSTACLE WILL PREVENT A MOTOR VEHICLE FROM BEING STORED ENTIRELY OFF THE
   PUBLIC R/W AFTER ENTERING SUCH DRIVEWAY.
4. DRIVEWAY APPROACH SHALL NOT BE CONSTRUCTED IN THE CURB RETURN AREA OF INTERSECTIONS NOR
   WITHIN 5' OF THE CURB RETURN AT EITHER END.
5. SPECIAL APRON DESIGN SHALL BE REQUIRED BY THE CITY ENGINEER WHERE CURB FACE HEIGHT EXCEEDS 6".
6. REMOVE AND REPLACE ALL ADJACENT FLOATING PIECES OF SIDEWALK LESS THAN 4' LONG.
7. A SIDEWALK EASEMENT AS SHOWN SHALL BE DEDICATED TO THE CITY.
NOTES:
1. MAXIMUM WIDTH (W) OF DRIVEWAY SHALL BE AS FOLLOWS:
   A. LOT FRONTAGE LESS THAN 100': 25'
   B. LOT FRONTAGE 100' OR MORE: 30' OR 20% OF FRONT FOOTAGE WHICHEVER MAY BE GREATER, BUT NOT
      TO EXCEED A MAXIMUM OF 36' WIDE.
   C. THE TOTAL AGGREGATE WIDTH OF DRIVEWAYS ON ONE LOT OR PARCEL IS LIMITED TO 36% OF THE
      TOTAL FRONTAGE.
2. THE MINIMUM DISTANCE BETWEEN THE END OF CURB RETURN (ECR) AT THE STREET AND ADJACENT
   PROPERTY LINE IS 1'.
3. IF THE PARKWAY IS OVER 10', THE DRIVEWAY SHALL BE CONSTRUCTED AS IF THE PARKWAY WERE 10' WIDE.
4. DRIVEWAY APPROACH SHALL NOT BE CONSTRUCTED OR MAINTAINED WHERE FENCE, BUILDINGS, NATURAL
   GRADE OR ANY OBSTACLE WILL PREVENT A MOTOR VEHICLE FROM BEING STORED ENTIRELY OFF THE
   PUBLIC R/W AFTER ENTERING SUCH DRIVEWAY.
5. DRIVEWAY APPROACH SHALL NOT BE CONSTRUCTED IN THE CURB RETURN AREA OF INTERSECTIONS NOR
   WITHIN 5' OF THE CURB RETURN AT EITHER END.
6. SPECIAL APRON DESIGN SHALL BE REQUIRED BY THE CITY ENGINEER WHERE CURB FACE HEIGHT EXCEED 6".
7. REMOVE AND REPLACE ALL ADJACENT FLOATING PIECES OF SIDEWALK LESS THAT 4' LONG.
NOTES:
1. 6" MIN CURB HEIGHT.
2. ALL CONCRETE SHALL BE 520-C-2500.
3. CURB CORES SHALL BE POSITIONED PER PLATE NO. 8-20.
4. MEDIAN AND PLANTER CURB SHALL INCLUDE BARRIER TO PREVENT MIGRATION/INTRUSION OF WATER INTO ADJACENT PAVEMENT OR BASE, TO THE SATISFACTION OF THE CITY ENGINEER.

DETAILS NOT TO SCALE
NOTES:
1. PROVIDE 3/4" DEEP SCORE LINE IN CURBS AND SIDEWALK AT EACH SIDE OF DRIVEWAY AND AT BOTH ENDS OF ANY CURB RETURN.
2. 4" A.B. TO BE PLACED UNDER SIDEWALK AND COMPACTED TO 90% RELATIVE COMPACTION.
3. REMOVAL OF CURB, GUTTER OR SIDEWALK SHALL BE TO SAW CUT EDGES. DO NOT LEAVE FLOATING PIECES < 8' LONG.
4. ALL CONCRETE SHALL BE 520-C-2500.
5. AN ACCESSIBLE PATHWAY OF 4' MIN. WIDTH MUST BE PROVIDED AT ALL TIMES. IF AN OBJECT (I.E., FIRE HYDRANT, UTILITY, ETC.) IS TO BE PLACED ON THE SIDEWALK, PROVIDE A SIDEWALK EXTENSION PER PLATE NOS. 8-8 OR 8-9.
NOTES:
1. USE #4 REINFORCING BARS AT 12" BOTH WAYS IN CROSS GUTTER AND SPANDRELS.
2. ALL CONCRETE SHALL BE 560-C-3250.
3. CROSS GUTTERS TO BE USED ONLY WHERE VEHICLES NORMALLY STOP.
4. DRAINAGE WATER TO BE TAKEN UNDERGROUND AT INTERSECTIONS ACROSS THROUGH TRAVELED ROADS.
5. SEE PLATE NO. 1-5 FOR CONCRETE DESIGN DETAILS.
NOTES:
1. SANITARY SEWER TO BE 5' SOUTH OR EAST OF STREET CENTER LINE, OR AS REQUIRED TO MEET 4’ MIN, CLEARANCE TO STORM DRAIN.
2. WATER TO BE 5' NORTH OR WEST OF STREET CENTER LINE, OR AS REQUIRED TO MEET 4’ MIN CLEARANCE TO STORM DRAIN.
3. ALL ELECTRICAL UTILITIES MAY BE PLACED IN COMMON TRENCH.
4. EACH RESPECTIVE UTILITY SHOULD BE CONSULTED FOR ANY SPECIAL REQUIREMENTS DUE TO UNIQUE FIELD AND DESIGN CONDITIONS. VAULTS, J-BOXES, PEDESTALS, ETC. SHALL BE LOCATED AT PROPERTY LINES.
5. A UTILITY SHALL NOT REDUCE THE REQUIRED 4’ MIN. WIDTH OF ACCESSIBLE PATHWAY FOR THE PHYSICALLY HANDICAPPED. IF NEEDED, PROVIDE SIDEWALK EXTENSION SIMILAR TO PLATE NOS. 8-8 OR 8-9.
6. NO UTILITIES IN MEDIAN UNLESS APPROVED BY THE CITY ENGINEER.
7. ENGRAVE 2” HIGH LETTER “S” IN CURB FACE AT LOCATION OF SEWER LATERAL.
8. STREET TREE PLANTING TO CONFORM TO PLATE NOS. 1-10 AND 8-17.
NOTE:
1. THE PRECISE LOCATION OF F.H. RELATIVE TO THE LOT LINE OR THE B.C.R. OFFSET MAY BE
   SHIFTED UP TO 5' TO AVOID CONFLICT WITH STREET LIGHTS, MAIL BOXES OR DRIVEWAY
   APPROACHES (PROVIDE 4' CLEARANCE FROM THESE IMPROVEMENTS).
2. LOCATION OF F.H. MUST BE APPROVED BY VENTURA COUNTY FIRE PROTECTION DISTRICT.
3. SEE CITY OF THOUSAND OAKS WATER DESIGN STANDARDS FOR ADDITIONAL REQUIREMENTS.
NOTES:

1. THE PRECISE LOCATION OF F.H. RELATIVE TO THE LOT LINE OR THE B.C.R. OFFSET MAY BE SHIFTED UP TO 5' TO AVOID CONFLICT WITH STREET LIGHTS, MAIL BOXES OR DRIVEWAY APPROACHES (PROVIDE 4' CLEARANCE FROM THIS IMPROVEMENTS).
2. LOCATION OF F.H. MUST BE APPROVED BY VENTURA COUNTY FIRE PROTECTION DISTRICT.
3. SEE CITY OF THOUSAND OAKS WATER DESIGN STANDARDS FOR ADDITIONAL LOCATION REQUIREMENTS.
4. NO SHRUBS, BUSHES OR IMPROVEMENTS EXCEEDING 6" IN HEIGHT WITH THIS AREA.
5. 8" CIRCULAR OR RECTANGULAR CONFIGURATION FOR CONCRETE PAD.
6. 4' SQUARE EASEMENT TO CITY OF THOUSAND OAKS FOR WATER IMPROVEMENTS IS REQUIRED.
NOTES:
1. DEVELOPER TO LEAVE OPENING (APPROXIMATELY 10" X 10" OR 10' DIA.) IN SIDEWALK FOR OWNER TO INSTALL POST FOR MAILBOX. OPENING TO BE FILLED IN WITH RIGID TEMPORARY MATERIAL (I.E., WOOD OR CONCRETE BLOCK). MAILBOX POST NOT TO EXCEED 8" IN DIAMETER.
2. PAIRED MAILBOXES TO BE LOCATED MAXIMUM 2' APART.
3. THE PRECISE LOCATIONS OF MAILBOXES RELATIVE TO THE LOT LINE MAY BE SHIFTED ± 5' TO AVOID CONFLICT WITH STREET LIGHTS, FIRE HYDRANTS OR DRIVEWAY APPROACHES (NO CLOSER THAN 4' FROM SUCH ITEMS).
4. MAILBOX LOCATIONS SHALL BE CONFIRMED BY PUBLIC WORKS INSPECTOR PRIOR TO INSTALLATION.
5. PROVIDE 42"-48" CLEARANCE FROM STREET TO BOTTOM OF MAILBOX, AND 6" FROM CURB FACE TO FRONT OF MAILBOX.
6. 4' CLEARANCE REQUIRED FROM MAILBOX TO BACK OF SIDEWALK (MINIMUM). SIDEWALK EASEMENT MAY BE REQUIRED.
MAILBOX OR FIRE HYDRANT SIDEWALK EXTENSION DETAIL
NOT TO SCALE

NOTES:
1. DEVELOPER TO LEAVE OPENING (APPROXIMATELY 10" X 10" OR 10" DIA.) IN SIDEWALK FOR OWNER TO INSTALL POST FOR MAILBOX. OPENING TO BE FILLED IN WITH RIGID TEMPORARY MATERIAL (I.E., WOOD OR CONCRETE BLOCK).
2. MAILBOXES TO BE LOCATED 2' APART SO MAILCARRIER CAN MAKE DEPOSIT IN EACH FROM ONE STOP LOCATION, IF POSSIBLE.
3. THE PRECISE LOCATION OF THIS EXTENSION RELATIVE TO THE LOT LINE MAY BE SHIFTED ±5' TO AVOID CONFLICT WITH STREET LIGHT ELECTROLIERS, DRIVEWAY APPROACHES (I.E., NO CLOSER THAN 4' FROM SUCH ITEMS).
4. EXTENSIONS FOR INDIVIDUAL MAILBOX LOCATIONS, OTHER THAN AT A COMMON PROPERTY BOUNDARY OR MULTIPLE INSTALLATIONS (I.E., 3 OR MORE GROUPED TOGETHER), MAY BE PERMITTED UPON SUBMITTAL OF A FINAL PLOT PLAN.
NOTES:
1. ALL TRENCHES SHALL BE BACKFILLED WITH 100-E-100 CEMENT/SAND SLURRY MIX.
2. THESE CONDITIONS SHALL BE IN ADDITION TO THOSE ON PLATE NO. 8-13.
3. JAGGED AND/OR ROUGH EDGES SHALL BE KEPT AT A MINIMUM. INSPECTOR WILL DETERMINE ANY ADDITIONAL SAW CUTTING. EXTREME CARE MUST BE EXERCISED ON OLDER ROADS WHERE A.C. HAS BROKEN UP OR BECOME BRITTLE. EXISTING A.C. SECTION ADJACENT TO CONCRETE GUTTERS, RAMPS, CURBS, MEDIAN, CATCH BASINS, AND DRIVeways LESS THAN 18" WIDE SHALL BE REMOVED AND REPLACED WITH FULL DEPTH A.C. SECTION AND AS DIRECTED BY THE PUBLIC WORKS INSPECTOR.
4. INITIAL BASE PAVE SHALL BE PER PLATE NOS. 1-5 AND 1-6. ASPHALT SHALL BE 1" THICKER THAN EXISTING, 6" MAXIMUM OR AS DIRECTED BY CITY ENGINEER.
5. ASPHALT FOR FINAL LIFT SHALL BE PER PLATE NOS. 1-5 AND 1-6.
6. SURFACE OF ALL TRENCHES SHALL BE MAINTAINED FLUSH WITH ADJACENT EXISTING PAVEMENT.
7. ALL WORK MUST BE COMPLETED WITHIN 30 DAYS OF STARTING DATE UNLESS OTHERWISE AUTHORIZED BY THE CITY ENGINEER.
8. FOR MULTIPLE TRENCH REPAIRS LOCATED ADJACENT TO EACH OTHER, DISTANCE BETWEEN REPAIRS SHALL BE NO LESS THAN 4' (FLOATERS LESS THAN 4' ARE NOT ALLOWED).
9. SEE PLATE NOS. 1-5 AND 1-6 FOR ADDITIONAL ASPHALT DETAILS.
10. APPLY TACK COAT ON PERIMETER EDGES OF FINAL TRENCH REPAIR.
TRAFFIC CONTROL NOTES:

1. ACTUAL FIELD CONDITIONS MAY REQUIRE SOME DEVIATION FROM THESE PLANS & NOTES. HOWEVER, ANY SUCH DEVIATIONS SHALL BE APPROVED BY THE CITY ENGINEER AT LEAST 72 HOURS PRIOR TO IMPLEMENTATION.

2. THESE PLANS & NOTES DO NOT APPLY TO EMERGENCY CONDITIONS ON BRIEF OPERATIONS WHERE PUBLIC & EMPLOYEE SAFETY ARE NOT JEOPARDIZED.

3. ALL ADVANCE WARNING SIGNS SHALL BE EQUIPPED WITH TWO ORANGE FLAGS.

4. ALL ADVANCE WARNING SIGNS SHALL BE A MINIMUM OF 36" X 36".

5. DAYTIME CHANNELIZATION DEVICES MAY CONSIST OF EITHER:
   A. 28" MINIMUM HEIGHT CONES, OR
   B. 37" MINIMUM HEIGHT TUBES, OR
   C. TYPE ONE BARRICADES.

6. ALL LANE CLOSURES AND DETOURS THAT ARE SCHEDULED TO REMAIN OVER ONE WEEK SHALL BE STRIPED AND ALL CONFLICTING STRIPES SHALL BE COMPLETELY REMOVED BY BLASTING (BLACK PAINT SHALL NOT BE USED).

7. THE FOLLOWING ARE ADDITIONAL REQUIREMENTS FOR ALL NIGHT TIME LANE CLOSURES AND DETOURS:
   A. AT LEAST ONE PERSON SHALL BE ASSIGNED FULL-TIME TO MAINTAIN TRAFFIC CONTROL DEVICES, AND
   B. ALL TRAFFIC SIGNS SHALL BE REFLECTORIZED, AND
   C. TYPE A OR B (FLASHING) YELLOW FLASHING BEACON WARNING LIGHTS SHALL BE USED AT ALL WARNING SIGNS.
   D. ALL CHANNELIZATION DEVICES SHALL BE EITHER:
      1. INTERNALLY ILLUMINATED CONES FITTED WITH 7" REFLECTIVE SLEEVES, OR
      2. TYPE 1 BARRICADES WITH TYPE C (STEADY BURN) YELLOW BARRICADE WARNING LIGHTS.

8. THE FOLLOWING ARE ADDITIONAL REQUIREMENTS ON ALL ROADS HAVING A POSTED SPEED LIMIT OF 40 MPH OR GREATER:
   A. ALL ADVANCE WARNING SIGNS SHOULD BE A MINIMUM OF 48" X 48", AND
   B. TYPE 1 OR 2 FLASHING ARROW SIGNS (FAS) SHALL BE USED ON ALL LANE CLOSURES.

9. NO TRENCHES SHALL BE LEFT OPEN OVERNIGHT WITHOUT THE EXPRESS WRITTEN PERMISSION OF THE CITY ENGINEER. TRENCHES SHALL BE EITHER PLATED OR BACKFILLED AND RESURFACED WITH TEMPORARY A.C.

10. ACCESS SHALL BE MAINTAINED AT ALL TIMES TO ALL INTERSECTING STREETS & DRIVEWAYS.

11. ALL PROVISIONS OF THE "MANUAL OF TRAFFIC CONTROLS" PUBLISHED BY THE STATE DEPARTMENT OF TRANSPORTATION SHALL APPLY. NOTHING IN THE CITY ROAD STANDARDS IS TO BE CONSTRUED AS TO REDUCE THE MINIMUM STATE STANDARDS.
NOTES:
1. SPECIES SHALL BE APPROVED BY THE CITY'S FORESTRY MASTER PLAN.
2. ALL TREES SHALL BE OF GOOD HEALTH WITH A SOUND ROOT SYSTEM AND STRAIGHT, SINGLE TRUNK.
3. MINIMUM TREE SIZE SHALL BE 24" BOX SIZE CONTAINER, WITH A 3/4" TRUNK CALIPER AND 6' HEIGHT. WHERE TREES ARE LOCATED WITHIN SIGHT DISTANCE AREAS PER PLATE 3-10, MINIMUM CANOPY CLEARANCE SHALL BE 8'.
4. CONTACT CITY LANDSCAPE INSPECTOR AT 805-449-2499, FOR APPROVAL OF LOCATIONS, QUALITY OF PLANT MATERIAL AND INSTALLATION.
5. SURFACE SIZE OF TREE WELL ARE TO BE 4' X 8' UNLESS AMERICAN DISABILITIES ACT (ADA) REQUIREMENTS NECESSITATE A SMALLER OPENING.
6. EXCAVATE PLANTING PIT WIDTH TWICE THE SIZE OF THE ROOT BALL, OR EQUAL TO WELL, WHICH EVER IS LARGER.
7. INSTALL 1-1/2' X 6' ROOT BARRIER PANEL (S) ADJACENT TO PAVING WHEREVER TREE IS 6' OR CLOSER TO HARDSCAPE (SIDEWALK, CURB, WALL, ETC.).
8. AMENDED BACKFILL SHALL EQUAL 2/3 EXCAVATED SOIL AND 1/3 "APPROVED" SOIL AMENDMENT. BACKFILL ENTIRE PLANT PIT/TREE WELL WITH AMENDED SOIL. THOROUGHLY TAMPER BACKFILL TO ELIMINATE AIR POCKETS.
9. TREES IN LAWN OR RESIDENTIAL FRONT YARDS SHALL HAVE A TRUNK PROTECTOR INSTALLED AT GROUND LEVEL, TO PREVENT DAMAGE TO BARK AND CAMBIUM.
10. ALL TREES SHALL BE PLANTED WITHIN THE CITY RIGHT-OF-WAY OR PUBLIC SERVICE EASEMENT.
11. SEE PLATE NOS. 1-8 AND 1-9 FOR ADDITIONAL STREET TREE PLANTING REQUIREMENTS.
12. ROOT BALL SHOULD BE FREE OF GIRDLING ROOTS.
STEEL PLATE FLUSH WITH EXISTING ASPHALT (BOTH SIDES)

LONGITUDINAL

1"

TRANSVERSE

STEEL PLATE ON TOP OF EXISTING ASPHALT (BOTH SIDES)

EXISTING BASE

TRENCH WIDTH

STEEL PLATE FLUSH WITH EXISTING ASPHALT (BOTH SIDES)

STEEL PLATE RECESSED ON TOP OF MILLED SURFACE ASPHALT

TRENCH WIDTH

TYPE 1 (FOR < 30 MPH OR AS REQUIRED BY CITY ENGINEER)

TYPE 2 (FOR > 30 MPH OR AS REQUIRED BY CITY ENGINEER)

PLATE SIZE

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NOTES:
SEE PLATE NO. 8-19 FOR NOTES.

DETAIL
NOT TO SCALE

CITY OF THOUSAND OAKS
PUBLIC WORKS DEPARTMENT

STANDARD
TRENCH PLATING DETAIL

PLATE NO.
8-18
NOTES:
1. USE TYPE 1 PLATE INSTALLATION WHERE POSTED SPEED LIMIT IS LESS THAN 30 MPH, USE TYPE 2 PLATE INSTALLATION WHERE POSTED SPEED LIMIT IS 30 MPH OR GREATER OR AS DIRECTED BY CITY ENGINEER.
2. FOR TYPE 2 PLATE INSTALLATION, THE STEEL PLATE SHALL BE RECESSED BY MILLING INTO THE EXISTING ASPHALT TO SET FLUSH WITH THE SURFACE OF THE EXISTING ASPHALT. FULL DEPTH CUTTING OF PAVEMENT SECTION OUTSIDE OF TRENCH IS NOT PERMITTED. MILLING DEPTH SHALL MATCH THICKNESS OF THE PLATE. THE GAP BETWEEN THE EDGE OF THE PLATE AND THE ADJACENT EXISTING ASPHALT PAVEMENT MUST BE FILLED WITH PROPERLY COMPACTED TEMPORARY ASPHALT.
3. TRENCH WIDTHS ARE BASED ON AN ANALYSIS PER THE LATEST EDITION OF STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES BY AASHTO. AN ASSUMED AXLE LOADING OF 12 TONS WITH A 30% IMPACT FACTOR WAS USED. THE AXLE LENGTH IS 6 FEET: THEREFORE THE NUMBER OF WHEELS CARRIED BY A PLATE DEPENDS ON THE ROADWAY WIDTH.
4. STEEL PLATE MUST BE ABLE TO WITHSTAND H-20 TRAFFIC LOADINGS WITHOUT ANY MOVEMENT.
5. PLATES SHALL BE FABRICATED FROM ASTM A36 STEEL (MINIMUM 36 KSI), WITH A NON-SKID SURFACE.
6. PLATES SHALL BE SECURED FROM LATERAL MOVEMENT AND VIBRATION (ASSOCIATED NOISE) WHILE IN USE BY TEMPORARY ASPHALT (COLD MIX).
7. NO TRENCHES IN THE PUBLIC RIGHT OF WAY SHALL BE LEFT OPEN OVERNIGHT OR OVER THE WEEKEND WITHOUT THE EXPRESS WRITTEN PERMISSION OF THE CITY ENGINEER. TRENCHES SHALL EITHER BE PLATED OR BACKFILLED AND RESURFACED WITH TEMPORARY ASPHALT.
8. PINS MADE OF #4 REBAR, OR EQUIVALENT DIAMETER STEEL ROD, WITH A MINIMUM LENGTH OF 12" SHALL BE USED TO SECURE ALL TRENCH PLATES TO THE PAVEMENT OR SOIL TO ELIMINATE LATERAL MOVEMENT OF THE PLATE. PINS OR STEEL RODS SHOULD NOT RESTRICT THE VERTICAL MOVEMENT OF THE STEEL PLATE. SPACING AND PLACEMENT OF PINS SHALL BE AS DIRECTED BY THE PUBLIC WORKS INSPECTOR.
9. WHEN TWO OR MORE PLATES ARE USED, THE PLATES SHALL BE TACK WELDED AT EACH CORNER OR AS REQUIRED BY THE PUBLIC WORKS INSPECTOR.
10. PLATES SHALL BE REMOVED THE FOLLOWING DAY, OR AS APPROVED BY THE PUBLIC WORKS INSPECTOR, AND THE TRENCH PAVED WITH TEMPORARY OR PERMANENT ASPHALT. PLATES SHALL NOT BE LEFT OVER A WEEKEND WITHOUT APPROVAL BY THE CITY ENGINEER.
11. PLATES SHALL BE CHECKED AT LEAST TWICE A DAY BY THE PERMITEE TO MAKE SURE THEY ARE SECURE.
12. APPROPRIATE ADVANCE WARNING SIGNS (I.E. "ROAD PLATES AHEAD") ARE REQUIRED FOR ALL STEEL PLATE CROSSINGS.
13. IN LIEU OF A STEEL PLATE, SIDEWALKS OR OTHER NON-VEHICLE AREAS MAY BE SECURED WITH PLYWOOD. PLYWOOD USED IN PEDESTRIAN AREAS SHALL BE A MINIMUM 3/4" THICK, PROVIDE A SMOOTH NON-SLIP SURFACE AND HAVE BEVELED EDGES.

(NOTE: THIS PLATE TO BE USED IN CONJUNCTION WITH PLATE NO. 8-18)
NOTES:
1. TYPE, DIMENSIONS AND ELEVATIONS OF SIDEWALK, CURB AND GUTTER PER PLATE NOS. 8-2 AND 8-3.
2. FOR NEW SIDEWALK PANELS, INSTALL GALVANIZED WIRE MESH OVER PVC PIPE. WIRE MESH SHALL EXTEND 8" BEYOND THE EDGE OF PVC PIPE.
EXISTING MANHOLE

RAISED MANHOLE

EXISTING VALVE

RAISED VALVE

FULL DEPTH MIN. 2", MAX. 6" A.C.
SURFACE COURSE FLUSH WITH OVERLAY

A.C. OVERLAY

EXISTING FRAME AND COVER
TO BE REUSED

EXISTING PAVEMENT

EXISTING STRUCTURE

PRECAST ADJUSTING RINGS
(18" MAX.)

6" MINIMUM CONCRETE

FULL DEPTH MIN. 2", MAX. 6" A.C.
SURFACE COURSE FLUSH WITH OVERLAY

A.C. OVERLAY

EXISTING FRAME AND COVER
TO BE REUSED

EXISTING PAVEMENT
UTILITY COVER ADJUSTMENT SPECIFICATIONS

1. REMOVAL OF EXISTING PAVEMENT:

EXISTING PAVEMENT SHALL BE COMPLETELY REMOVED TO THE PAVEMENT SAW CUT LIMIT SHOWN ON PLATE NO 8-21. ALL WORK TO BE PERFORMED SHALL BE IN ACCORDANCE WITH CITY OF THOUSAND OAKS ROAD STANDARDS, PLATE NO 8-21. BEFORE ANY EXISTING PAVEMENT IS REMOVED, REVIEW DETAILS OF RAISING UTILITY STRUCTURES..

2. UTILITY ADJUSTMENTS GENERAL NOTES:

A. CONCRETE SHALL BE GREENBOOK SPECS 560-C-3250 CONCRETE AND ALLOWED TO CURE 48 HOURS PRIOR TO A.C. OVERLAY.

B. ALL UTILITY COVERS TO BE RAISED SHALL BE REUSED, UNLESS REPLACEMENT IS REQUESTED BY THE CITY AT THE CITY’S EXPENSE. THE NEW RING AND COVER WILL BE PROVIDED PRIOR TO CONSTRUCTION FOR REPLACEMENT.

C. GRADE RINGS SHALL BE 3’ OR 6”. GRADE RINGS AND MANHOLE FRAMES SHALL BE SEALED AT EVERY JOINT WITH BUTYL RUBBER (CONSEAL CS-102 OR APPROVED EQUAL).


E. ASPHALT SURFACE COURSE SHALL BE 1/2" HMA TYPE B OR C2 (DENSE MEDIUM).
APPENDIX C

City Road Design and Standards

Only select sheets are included here. Refer to complete City’s Standards, which can be accessed by using the following address:

NOTES:
1. TRIM TO BE 1½" WIDE, WITH COLOR BEING "BUNGALOW BROWN".
2. ALL LETTERING TO BE SAME COLOR AS TRIM.
3. BACKGROUND COLOR OF SIGN TO BE "NAVAJO WHITE".
4. MOUNTING DETAILS ARE AS SHOWN HEREON.
5. WORDING ON THE SIGN MAY SUBJECT TO CHANGE.
6. FINAL WORDING ON THE SIGN AND LOCATION OF THE PROJECT SIGN SHALL BE APPROVED BY THE CITY.
NOTES:
1. SIGN PANELS TO BE \( \frac{3}{4} \)" EXTERIOR PLYWOOD, MDO, GRADE.
2. FASTEN BRACES WITH (3) 16d STEEL NAILS AT EACH END OF BRACE.
3. ALL LUMBER SHALL CONFORM TO SEC.204--1.2 OF THE "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, LATEST EDITION.
4. FASTEN POSTS WITH 4"X4"X\( \frac{3}{4} \)" ANGLE IRON AND \( \frac{3}{8} \)"X3" LAG SCREWS.
5. PLACE 6" SIDE OF POST NORMAL TO SIGN.
6. REFLECTORS SHALL BE SIMILAR TO TYPE W6OR OR APPROVED EQUAL. (EQUALLY SPACED AS SHOWN)
APPENDIX D

Project Identification Sign
APPENDIX E

Sample Loop Drawing

(as referred to in Section 17 50 00 Paragraph 1.04.B.3)