CONSTRUCTION CONTRACT DOCUMENTS

Grizzly Flat Community Services District

CLEARWELL REPLACEMENT PROJECT

BID SET

February 10, 2026

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SECTION 1. BIDDING REQUIREMENTS AND SUBMITTALS

1.1 INVITATION TO BID

Sealed Proposals will be received by **Grizzly Flats Community Services District** ("Owner"), located at **4765 Sciaroni Rd, Grizzly Flats, CA 95636,** until **2:00 p.m.** local time on **Monday, March 9th, 2026** or such later date as may be set by addendum, and then will be publicly opened and read for the construction of the following public works project:

The proposed work generally consists of the following:

Clearwell Replacement Project

The work is more specifically described in the Contract Documents.

The Contract Documents, including the Instructions to Bidders, Contract, performance requirements, and other specifications and descriptions of the Work, may be examined at Owner's office,. A copy of the Contract Documents may be downloaded from the Owner's website at Grizzly Flats Community Services District » Homepage (grizzlyflatscsd.com). The Bidder's attention is directed to the Instructions to Bidders for complete instructions regarding submission of bid.

Each Bidder and all subcontractors must be registered with the California Department of Industrial Relations Public Works Contractor Database, pursuant to Labor Code § 1725.5.

Each Bid must be submitted on the prescribed forms and accompanied by cash, a cashier's check, certified check or bid bond executed on the prescribed form payable to Owner in an amount not less than 10 percent (10%) of the bid amount.

If the Contract Documents for the project contain additive items, bidders must bid all of the additive items. However, the lowest bid shall be considered to be the lowest bid price on the base contract without consideration of the prices on the additive items, pursuant to California Public Contract Code § 10126(c)(1).

A pre-bid walk through will be provided for all prospective bidders to review the work sites and address Bidder questions. The pre-bid walk through will be conducted at **10:00 a.m. on Thursday, February 26th, 2026** at the Owner's Main Office located at **4765 Sciaroni Rd, Grizzly Flats, CA 95636.**

The successful bidder will be required to pay all permits, fees and taxes associated with Work as defined in the Contract Documents.

The successful bidder will be required to furnish insurance with certificates and endorsements of insurance, as provided in the Contract Documents. The required bonds must be provided by a surety insurer who is duly admitted by the Insurance Commissioner of the State of California.

At the time of submitting the bid, the successful bidder must hold such valid licenses issued by the California State Contractors' License Board as may be required by the laws of the State of California for the performance of the work specified in the Contract Documents. Licenses must include all of the following:

- General Contractor Class A

Bidders are encouraged, although not required, to utilize local labor to the greatest extent possible.

The attention of bidders is directed to the requirements and conditions of employment to be observed and prevailing wage rate to be paid under the Contract. Copies of the prevailing rate of per diem wages are on file at Owner's office and will be made available to any interested party on request.

Pursuant to Public Contract Code § 22300, Owner shall permit the substitution of securities for any moneys withheld in retention by Owner.

All questions concerning the Bid Documents and the Project should be addressed to the Scott Myers, District Engineer, H2O Urban Solutions, Inc., in writing to the following email: scott@h2ourban.com. Questions must be submitted no later **than March 4th, 2026.** The answer to relevant questions will be addressed through a formal addenda process.

Owner reserves the right to reject any and all Bids during the time for awarding the Contract, and to waive any informality or irregularity in any Bid. No Bid can be withdrawn during the time for awarding the Contract. Any bid not conforming to the intent and purpose of the Contract Documents may be rejected. Owner may extend the time to award the Contract for a period of time which shall not extend beyond 60 days from the bid opening date.

1.2 BID FORM/ PROPOSAL

TO: Kim Gustafson, General Manager
Grizzly Flats CSD
4765 Sciaroni Rd, Grizzly Flats, CA 9563

THE UNDERSIGNED STATES AND DECLARES AS FOLLOWS:

The undersigned Bidder has carefully examined the location of the proposed work and has examined the Contract Documents entitled:

Clearwell Replacement Project

The Bidder has read the accompanying Invitation to Bid and Instructions to Bidders and has participated in the mandatory pre-bid walk-through; the Bidder hereby proposes to begin work and complete the project in accordance with the schedule and deadlines in the Contract Documents; the Bidder hereby proposes to furnish all labor, materials, tools, and equipment, and to perform all the work required, complete in place, in accordance with the Contract Documents; and the Bidder will take in full payment for such work the prices set forth in the accompanying Base Bid Schedule. The Bidder herewith submits its Base Bid as reflected on the accompanying Base Bid Schedule and submits its Alternatives Bids, as reflected on the accompanying Alternates Bid Schedules.

TOTAL BASE BID: **$**_____

Contractor's License No.: _____

Expiration Date: _____

Type of license: _____

Name under which license is held: _____

Status of license: _____

The following surety or sureties have agreed to furnish payment and faithful performance bonds to the Bidder if it is awarded the contract:

Payment Bond: _____

Performance Bond: _____

The Bidder's authorized officer identified below hereby declares that the representations in this Bid are true and correct and that these representations are made under penalty of perjury under the laws of the State of California.

Executed on _____, 20__, at _____, _____.

BIDDER

[Company/firm name] _____

[Capacity of company or firm, e.g., corporation (include state of incorporation), sole proprietor, partnership] _____

[Authorized signature] _____

[Name] _____

[Title] _____

Address: _____

Phone No.:

Fax No.:

E-Mail:

1.3 BASE BID SCHEDULE AND TOTAL PRICE

NAME OF BIDDER: _____

ALLOWANCES AND UNIT PRICES FOR BASE BID

Clearwell Replacement Project

UNIT PRICE TABLE

Bid Item	Work Item Description	Unit	Quantity	Unit Price	Total Price
1	Sheeting, Shoring, Bracing	L.S.	1		
2	Mobilization	L.S.	1		
3	Existing Tank Demolition	L.S.	1		
4	Site Preparation	L.S.	1		
5	Site Underground and Pipe	L.S.	1		
6	Concrete Ringwall Foundation	L.S.	1		
7	Welded Steel Tank	L.S.	1		
8	Steel Tank Coatings	L.S.	1		
9	Tank Disinfection, Testing, and Commissioning	L.S.	1		
	Total Bid Price				

TOTAL BID PRICE ALL ITEMS: $ [IN FIGURES]

_____

Bidders Initials: _____

Alternate Bid Items					
A	Precast Concrete Masonry Landscape Wall	L.S.	1		

Owner reserves the right to include or delete alternate bid items in the Work without incurring any penalty or additional cost to base bid.

1.4 BID BOND

WHEREAS WE, THE UNDERSIGNED _____, Contractor as Principal; and _____, as Surety, are hereby held and bound unto _____, hereinafter called Owner, in the sum of $_____ which sum is equal to at least ten percent of the total amount of the Bid, payment of which sum, well and to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

The condition of the above obligation is such that whereas the Principal has submitted to Owner a certain Bid, attached hereto and hereby made a part hereof, to enter into a Contract in writing, for the construction of the following public works project:

Clearwell Replacement Project

NOW, THEREFORE,

(a) If the Bid is rejected, or in the alternate,

(b) If the Bid is accepted and the Principal shall sign and deliver a Contract, in the form of the Contract attached hereto and shall execute and deliver Performance and Payment Bonds in the forms attached hereto and shall deliver proof of insurance (all completed in accordance with the Contract Documents), and shall in all other respects perform the agreement created by the acceptance of the Bid;

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

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which Owner may accept such Bid, and said Surety does hereby waive notice of any such extension.

IN WITNESS THEREOF, the above-bounded parties have executed this instrument under their several seals this _____day of _____20___, the name and

corporate seal of each corporate party being hereto affixed and those presents duly signed by its undersigned representative, pursuant to authority of its governing body.

(Contractor as Principal)

(Seal) By: _____

[Name]

[Title]

(Surety)

(Seal) By: _____

[Name]

[Title]

1.5 DESIGNATION OF SUBCONTRACTORS

In compliance with Public Contract Code § 4100 et seq. each bidder shall set forth below the name, license number and business location of each subcontractor who will perform work in excess of one-half of 1% of the Contractor's total bid and the portion of the work (expressed in dollar amount) that will be performed by each subcontractor. Contractor shall also provide a description of the type of work to be performed by each subcontractor. **Under Labor Code § 1725.5, the Contractor and all subcontractors must be registered with the California Department of Industrial Relations Public Works Contractor Database.**

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

Subletting or subcontracting of any portion of the work in excess of one-half of 1% of the Contractor's total bid as to which no subcontractor was designated in the original bid shall only be permitted in cases of public emergency or necessity, and then only after a finding reduced to writing as a public record of the County setting forth the facts constituting the emergency or necessity.

Subcontractor (name and location)	**Description of Subcontractor Work**	**Subcontractor License Type and #**	**Estimated Portion of Work (in $$)**

Subcontractor (name and location)	Description of Subcontractor Work	Subcontractor License Type and #	Estimated Portion of Work (in $$)

1.6 EXPERIENCE QUALIFICATIONS AND REGISTRATION

The Bidding Contractor and all of its Subcontractors must be registered with the California Department of Industrial Relations Public Works Contractor Database, pursuant to Labor Code § 1725.5.

The Bidder has been engaged in the contracting business, under the present business name for _____ years. Experience in work of a nature similar to that covered in the Bid extends over a period of _____years.

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

The following contracts have been satisfactorily completed in the last three years for the persons, firm or entity indicated: (Bidder may provide additional experience statements).

Year	Owner	Type of Work	Contract Amount

The following is a list of plant and equipment owned by the Bidder, which is definitely available for use on the proposed work as required. (Bidder may provide additional list of plant and equipment available).

Quantity	Name, Type and Capacity	Condition	Location

Executed on _____, 20__, at _____

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

BIDDER

_____(Company/firm name)

_____(Authorized signature)

_____(Name)

_____(Title)

1.7 NON-COLLUSION DECLARATION*

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 for the _____ PROJECT.

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 its 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].

By: _____

Title: _____

*Note: Public Contracts Code 7106 requires this non-collusion declaration be submitted with a bid for any public works contract of a public entity.

1.8 CERTIFICATION OF NON-DISCRIMINATION

1. During the performance of this contract, contractor and its subcontractors shall not unlawfully discriminate against any employee or applicant for employment because of race, religion, color, national origin, ancestry, physical handicap, medical condition, marital status, age (over 40) or sex. Contractors and subcontractors shall insure that the evaluation and treatment of their employees and applicants for employment are free of such discrimination. Contractors and subcontractors shall comply with the provisions of the Fair Employment and Housing Act (Government Code § 12900 et seq.) and the applicable regulations promulgated thereunder (California Administrative Code, Title 2, § 7285.0 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code, § 12900, set forth in Chapter 5 of Division 4 of Title 2 or the California Administrative Code are incorporated into this contract by reference and made a part hereof as if set forth in full. Contractor and its subcontractor shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.

2. This contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the contract.

THE UNDERSIGNED CERTIFIES THAT CONTRACTOR WILL COMPLY WITH THE ABOVE REQUIREMENTS.

CONTRACTOR OR

SUBCONTRACTOR NAME: _____

CERTIFIED BY:

NAME: _____ TITLE: _____

SIGNATURE: _____ DATE: _____

1.9 CERTIFICATION OF NON-SEGREGATED FACILITIES

A certification of non-segregated Facilities, as required by the May 9, 1967, order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e. quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

DATE _____

(Signature of Bidder or Prospective Contractor)

Address (including Zip Code)

1.10 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS

Name of Company/Entity: _____

The prospective participant certifies under penalty of perjury to the best of its knowledge and belief that it and its principals and subcontractors:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by a government entity (Federal, State, or local).

(b) Have not within a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraphs (a) and (b) of this certification;

(d) Have no more than one final unappealable finding of contempt of court by a federal court issued against them within the immediately preceding two year period because of failure to comply with an order of a federal court which orders the Contractor to comply with an order of the National Labor Relations Board;

(e) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC § 1001, a false statement may result in a fine of up to $ 10,000 or imprisonment for up to five (5) years, or both.

Name and Title of Authorized Representative (Typed/printed)

Signature of Authorized Representative Date

☐ I am unable to certify to the above statements. My explanation is below.

[RESERVED FOR EXPLANATION OF INABILITY TO CERTIFY TO SECTION 1.10]

SECTION 2. INSTRUCTIONS TO BIDDERS

2.1 INTRODUCTION

Each bid shall be in accordance with these Instructions to Bidders and other applicable provisions of the Contract Documents. The Invitation to Bid will specify whether Contract Documents are available on a purchase or deposit basis. Where payment for such sets is specified, no refund will be made.

2.2 PLANS

Electronic copies of Contract Documents may be obtained from Owner's Engineer.

2.3 LOCAL CONDITIONS

2.3.1 The quantities of work or material stated in the unit price items of the Bid Schedule are given only as a basis for the comparison of Bids, and Owner does not represent or warrant that the actual amount of work or material will correspond therewith, but reserves the right to increase or decrease the quantity of any unit price item of the work as may be deemed necessary or expedient by Architect.

2.3.2 The Bidder shall examine carefully the site of the work contemplated and the Contract Documents. The submission of a Bid shall be conclusive evidence that the Bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality and quantities of work to be performed and the materials to be furnished, and as to the requirements of the Contract Documents. Bidders shall thoroughly examine and be familiar with the Plans and Specifications. The failure of any bidder to receive or examine any form, instrument, addendum or other document, or to visit the site and acquaint himself with conditions there existing shall in no way relieve the Bidder from any obligation with respect to its proposal or to the Contract.

2.3.3 Not Used.

2.3.4 Not Used.

2.3.5 Not Used.

2.3.6 The availability or use of information described in the Instructions to Bidders and other bid documents shall not be construed in any way as a waiver of the provisions of the Instructions of Bidders and a Bidder or Contractor is cautioned to make such an investigation and examination as it deems necessary to satisfy itself as to conditions to be encountered in the performance of the work and, with respect to possible local material sources, the quality and quantity of material available from such property and the type and extent of processing that may be required in order to produce material conforming to the requirements of the Specifications.

2.3.7 Not Used.

2.3.8 Information derived from inspection of topographic maps, or from Plans showing location of utilities and structures will not in any way relieve Contractor from any risk, or from properly examining the site and making such additional investigations as it may elect, or from properly fulfilling all the terms of the Contract.

2.4 FORM OF BID AND SIGNATURE

Bids shall be submitted only on the forms attached hereto or copies thereof and shall be enclosed in a sealed envelope and marked and addressed as directed herein. On the Bid Schedule, the Bidder shall state in figures the unit prices or the specific sums as the case may be, for which he proposes to supply labor, materials, supplies, tools or equipment, and perform the work required by the Contract Documents.

If the Bid is made by an individual, it shall be signed by its full name and its address shall be given; if it is made by a partnership, it shall be signed with the partnership name by a member of the partnership, who shall also sign his or her own name, and the name and address of each member of such partnership shall be given; and, if it is made by a corporation the **name of the corporation shall be given and it shall be signed by the appropriate duly authorized officer or officers, the name(s) and title(s) of all signing officers of the corporation shall be given, and the address of the corporation and the state in which incorporated shall be stated.**

Bids will be considered only from persons licensed as and set forth herein and required under applicable provisions of Contractors' License Law (California Business and Professions Code § 7000, et seq.) and rules and regulations adopted pursuant thereto; and each bidder shall insert its type of contractor's license, license number, and other requested information in the place provided in the bid. No oral, telephonic, e-mail, facsimile or telegraphic Bid or modification of a Bid will be considered.

2.5 PREPARATION OF THE BID

2.5.1 Blank spaces in the Bid shall be properly completed. The phraseology of the Bid must not be changed and no additions shall be made to the items mentioned therein. Unauthorized conditions, limitations or provisions attached to a Bid may render it nonresponsive and may cause its rejection. If erasures, interlineations or other changes appear on the form, each erasure, interlineation or change must be initialed by the person signing the Bid. Alternative Bids will not be considered unless specifically provided for in the Bid Schedule. Where performance and/or labor and material bonds are required, the Bidder shall name in its Bid the surety or sureties that have agreed to furnish the bonds.

2.5.2 The Contract General Conditions provides that the successful Contractor shall pay all federal, state and local taxes, including manufacturers' taxes, sales taxes, use taxes, processing taxes, and payroll, wage, insurance, social security, and

unemployment taxes on wages, salaries or any remuneration paid to Contractor's employees. A bidder's bid prices shall be deemed to include all applicable taxes, and there shall be no separate bid item or billing for taxes.

2.6 SUBMISSION OF BIDS

2.6.1 Bids must be submitted not later than the time prescribed, at the place and in the manner set forth in the Invitation to Bid. Owner shall not consider any Bid received after the time fixed or received at any place other than the place stated in the Invitation to Bid. Bids must be made on the prescribed Bid forms.

A complete Bid requires submission of the following fully completed and executed documents:

a. Section 1.2 Bid Form

b. Section 1.3 Base Bid and Section 1.3.1 Alternates Bid Form (if applicable);

c. Section 1.4 Bid Bond (or other bid guarantee);

d. Section 1.5 Designation of Subcontractors;

e. Section 1.6 Experience Qualifications;

f. Section 1.7 Non-Collusion Declaration;

g. Section 1.8 Non-Discrimination Clause;

h. Section 1.9 Certification of Non-Segregated Facilities;

i. Section 1.10 Certification Regarding Debarment, Suspension and other Responsibility Matters.

Each Bid must be submitted in a sealed envelope, so marked as to indicate its contents without being opened, and addressed in conformance with the instructions in the Invitation to Bid. The bidder is wholly responsible to see that its Bid is submitted at the time and place named for the opening of bids.

2.6.2 Bids shall acknowledge receipt of all addenda (identified by addendum number) issued during the bidding period. Failure to acknowledge an addendum or clarification may result in the Bid being rejected as not responsive.

2.6.3 Bids shall be opened at the time and place specified in the Invitation to Bid, unless changed by addendum. All Bids will be opened and read publicly. Bidders, their representatives and other interested parties are invited to be present at the opening.

2.7 BID GUARANTEE

2.7.1 All Bids shall be accompanied by a Bid Bond, as defined, made payable to Owner. The Bid Bond must be enclosed in the same envelope with the Bid. The amount of the Bid Bond shall be not less than 10 percent of the total amount of the Bid.

2.7.2 If a bond is utilized, the Attorney-in-Fact (resident agent) who executes the Bid Bond on behalf of the surety company must attach a copy of its Power of Attorney as evidence of its authority. A notary shall acknowledge the power as of the date of execution of the surety bond which it covers. A bond will be accepted only if it is made out on either the Bid Bond form enclosed in these documents or on a form which substantially conforms to it.

2.8 LIST OF SUBCONTRACTORS

Each bidder shall set forth in its Bid on the form provided the following information in accordance with the provisions of California Public Contract Code § 4100, et seq.: (a) the name, license number and location of the place of business of each subcontractor who will perform work or labor or render service to Contractor in or about the construction of the work or improvement, and of each subcontractor who, under subcontract to Contractor, is to specifically fabricate and install or provide a portion of the work or improvement according to the Contract Documents, in any amount in excess of ½ of 1 percent of Contractor's total Bid; (b) the portion of the work that will be done by each such subcontractor; and (c) a description of the work to be done by each such subcontractor. Only one subcontractor shall be listed for each portion of the work as defined in the Bid. If the bidder fails to specify a subcontractor for any portion of the work, the bidder agrees to perform that portion of the work itself. **All subcontractors must be registered with the California Department of Industrial Relations Public Works Contractor Database, pursuant to Labor Code § 1725.5.**

2.9 INTERPRETATION OF CONTRACT DOCUMENTS

2.9.1 Any explanation desired by the bidder regarding the meaning or interpretation of any of the Contract Documents must be requested in writing, with sufficient allowance of time for receipt of reply before the time set for opening of Bids. Any such explanations or interpretations will be made only in the form of addenda to the documents and will be furnished to all bidders who shall submit all addenda with their Bids. Neither Architect nor any representative of Owner is authorized to give oral explanations or interpretations of Contract Documents, and a submission of a Bid constitutes agreement by the bidder that he has placed no reliance on any such oral explanation or interpretation. However, Architect may, upon inquiry by bidder, orally direct the bidder's attention to specific provisions of the Contract Documents which cover the subject of the inquiry.

2.9.2 The Bidder shall review the Plans and Specifications prior to submission of the bid and shall report to Owner any errors and omissions noted by the Bidder prior to such submission.

2.10 MODIFICATION OF BIDS

A Bidder may modify its Bid by written communication provided such communication is received by Owner prior to the closing time for receipt of Bids. The written communication shall not reveal the Bid price but should state the addition or subtraction or other modification so that the final prices or terms will not be known by Owner until the sealed bid is opened.

2.11 WITHDRAWAL AND RETURN OF BIDS

Bids may be withdrawn without prejudice by written, e-mail, facsimile or telegraphic requests received from the Bidder prior to the time for opening of Bids, and Bids so withdrawn will be returned to bidders unopened. No Bid may be withdrawn after the hour affixed for opening Bids without rendering the accompanying Bid Bond subject to retention as liquidated damages in like manner as in the case of failure to execute the Contract after award, as provided in the Contract Documents. Negligence on the part of the Bidder preparing its Bid shall not constitute a right to withdraw the Bid subsequent to the opening of Bids. Any Bid received after the bid submission deadline shall be returned to the bidder unopened.

2.12 DISCREPANCIES

In the case of discrepancy between unit prices and totals, unit prices will prevail. In case of discrepancy between words and figures, words will prevail.

2.13 SERVICING AND MAINTENANCE

Each Bidder must, if requested, furnish evidence that there is an efficient service organization which regularly carries a stock of repair parts for the proposed equipment to be furnished and installed in the work and that the organization is conveniently located for prompt service.

2.14 DISQUALIFICATION OF BIDDERS

2.14.1 More than one Bid from an individual, firm, partnership or corporation under the same or different names will not be considered. Reasonable grounds for believing that any individual, firm, partnership or corporation is interested in more than one Bid for the work contemplated may cause the rejection of all Bids in which the individual, firm, partnership or corporation is interested. If there is reason for believing that collusion exists among the bidders, any or all Bids may be rejected. Bids in which the price is obviously unbalanced may be rejected.

2.14.2 All bidders are put on notice that any collusive agreement fixing the prices to be bid so as to control or affect the awarding of this Contract is in violation of the competitive bidding requirements applicable to Owner and may render void any contract let under such circumstances.

2.15 AWARD OF CONTRACT

2.15.1 Owner reserves the right to reject any and all Bids during the time for awarding the Contract, and to waive any informality or irregularity in any Bid. No Bid can be withdrawn during the time for awarding the Contract. The time for awarding the Contract is provided in section 2.17.

2.15.2 Before a Bid is considered for award, Owner may require a Bidder to submit a statement of facts and detail as to its business, technical organization and financial resources and equipment available and to be used in performing the work. Additionally, Owner may require evidence that the Bidder has performed other work of comparable magnitude and type.

Owner expressly reserves the right to reject any Bid if it determines that the business and technical organization, equipment, financial and other resources or other experience of the Bidder (including the Bidder's subcontractors) is not sufficiently qualified for the work bid upon and, therefore, justifies such rejection.

2.15.3 The award of the Contract, if it is awarded, will be to the lowest responsible responsive Bidder whose Bid complies with the requirements of the Contract Documents. The lowest bid shall be considered to be the lowest bid price on the base contract with applied discounts based on the number of units bid, pursuant to California Public Contract Code § 10126(c)(1).

CONTRACT BONDS

2.16.1 The successful Bidder shall furnish both a Performance Bond and a Payment Bond in the type, form and amount specified in the forms included with the Contract Documents. These bonds shall be furnished on such forms or on substantially similar forms acceptable to Owner. The Payment Bond shall comply with California Civil Code §§ 3247, 3248 and 9550 et seq. and applicable provisions of the California Bond and Undertaking Law (California Code of Civil Procedure § 995.010 et seq.). The bonds shall be obtained from a responsible corporate surety (or sureties) acceptable to Owner, who is (or are) duly admitted by the Insurance Commissioner of the State of California to act as surety upon bonds and undertakings. The surety (or sureties) shall furnish reports as to its financial condition from time to time as requested by Owner. The premiums for the bonds shall be paid by the successful Bidder.

2.16.2 If any surety becomes unacceptable to Owner, is deemed insolvent, is no longer an admitted surety in California, or fails to furnish reports as to its financial condition as requested by Owner, Contractor shall promptly furnish such additional

security as may be required from time to time to protect the interests of Owner and of persons supplying labor or materials in the prosecution of the work contemplated by this Contract.

2.16.3 In the event of any conflict between the terms of the Contract and the terms of the bonds, the terms of the Contract shall control and the bonds shall be deemed to be amended thereby. Without limiting the foregoing, Owner shall be entitled to exercise all rights granted to it by the Contract in the event of default, without control thereof by the surety, provided that Owner gives the surety notice of such default at the time or before the exercise of any such right by Owner, and, regardless of the terms of the bonds, the exercise of any such right by Owner shall in no manner affect the liability of the surety under the bonds.

2.17 EXECUTION OF CONTRACT

The successful Bidder will be notified in writing by Owner of the award of the Contract within thirty (30) days after opening of Bids, unless the time period is extended as provided in the Invitation to Bid. Accompanying Owner's notice of award will be the Contract, which Owner may require to be executed in duplicate or triplicate. Within fifteen (15) days following receipt of such notice of award, the successful bidder will be required to execute and return the original contract(s), together with the performance and payment bonds, and the required certificates and proof of insurance documents (see General Conditions section 5.52), to Owner. Failure to do so shall be just cause for annulment of the award and for forfeiture of the Bid Bond, which shall be retained as liquidated damages. It is agreed that the Bid Bond sum is a fair estimate of the amount of damages that Owner will sustain by reason of such failure. Owner may elect to extend the fifteen (15) days if it needs additional time to Contractor information.

Owner will promptly determine whether such Contract, bonds and insurance conform with the requirements of the Contract Documents, and upon such determination will forward a fully executed copy of the Contract and a Notice to Proceed with the work to the successful bidder. Signature by both parties constitutes execution of the Contract. In the event of failure of the lowest responsible responsive Bidder to sign and return the Contract with acceptable bonds and insurance as prescribed herein, Owner may award the Contract to the next lowest responsible responsive Bidder, and, in the event that Bidder fails to sign and return the Contract with acceptable bonds and insurance, Owner may award the Contract to the then next lowest responsible responsive Bidder, etc.

2.18 RETURN OF BID GUARANTEES

All Bid Bonds will be held until the Contract has been finally executed, after which all Bid Bonds, other than any Bid Bonds which have been forfeited, will be returned to the respective bidders whose Bids they accompanied, but in no event shall

non-forfeited bonds be held by Owner beyond 60 days from the date that Owner awards the Contract.

2.19 POWER OF ATTORNEY

The Attorney-in-Fact (resident agent) who executes the Performance Bond and Payment Bond on behalf of the surety company must attach a copy of its Power of Attorney as evidence of its authority. A notary public shall acknowledge the power as of the date of the execution of the bond which it covers.

2.20 TIME OF COMPLETION

The time of completion of the work to be performed under this Contract is the essence of the Contract. Delays and extensions of time may be allowed in accordance with the provisions of the General Conditions. The time allowed for the completion of the work is stated in Paragraph 5 of Section 3.1, the Contract Agreement.

2.21 LICENSING REQUIREMENTS FOR CONTRACTORS

Contractor shall hold such valid licenses issued by the California State Contractors' License Board as may be required by the laws of the State of California for the performance of the work specified in the Contract Documents.

2.22 PREVAILING WAGES

Copies of the prevailing rate of per diem wages are on file at Owner's office, and will be made available to any interested party on request. Contractor shall post at each job site a copy of the determination of the Director of Industrial Relations of the prevailing rate of per diem wages in the locality in which this public work is to be performed.

2.23 BID PROTEST

Any bid protest must be submitted in writing to Owner before 5:00 p.m. of the seventh day following the bid award.

2.23.1 The bid protest shall be in the form of a letter or memo and it shall include the following: a complete statement of the basis or bases for the protest, including any supporting documents; a reference to the specific portion(s) of the Contract Documents which forms the basis for the protest; and, the name, address and telephone number of the person representing the protesting bidder.

2.23.2 The bidder filing the protest shall concurrently transmit a copy of the protest document and any attached documentation to all other bidders with a direct financial interest who may be adversely affected by the outcome of the protest,

including all other bidders who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.

2.23.3 Owner will issue a prompt decision on the protest. If Owner determines that a protest is frivolous, the party originating the protest may be determined to be irresponsible and that party may be determined to be ineligible for future contract awards.

2.23.4 The procedure and time limits set forth in this section are mandatory and are the bidder's sole and exclusive remedy in the event of a 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, lawsuit or other legal proceeding.

2.23.5 For purposes of this section, a "bid protest" means any protest, objection, complaint or challenge to, concerning or against (a) a rejection of a bidder for any reason, (b) a contract award to the apparent low bidder, (c) another bidder's bid, or (d) the legality or enforceability of the bid documents.

2.24 INELIGIBLE CONTRACTORS AND SUBCONTRACTORS

Owner shall not accept a bid from a bidder who is ineligible to bid or work on, or be awarded, a public works project pursuant to California Labor Code § 1777.1 or 1777.7. Bidders and Contractor who is awarded the project contract shall not utilize, or allow work by, any subcontractor who is ineligible to bid or work on, or be awarded, a public works project pursuant to California Labor Code § 1777.1 or 1777.7. (See California Public Contract Code § 6109.) The California Division of Labor Standards Enforcement publishes a list of debarred contractors and subcontractors on the Internet at www.dir.ca.gov/DLSE/debar.html.

Contractors and Subcontractors who are not registered with the California Department of Industrial Relations Public Works Contractor Database, pursuant to Labor Code § 1725.5, shall be considered ineligible.

SECTION 3. CONTRACT FORMS

[The remainder of this page is intentionally left blank.]

3.1 CONTRACT AGREEMENT

THIS AGREEMENT, dated the ____day of _____, 20__, in the County of El Dorado, State of California, is made by and between the _____ ("OWNER"), and _____ ("CONTRACTOR").

1. Contract Documents: The complete contract ("CONTRACT") includes all of the CONTRACT DOCUMENTS, including this Agreement, the Invitation to Bid, Bid Form/Proposal, Bid Schedules, Bid Bond, Designation of Subcontractors, Experience Qualifications, Non-collusion Declaration, Non-discrimination Certification, Non-segregation Certification, Instructions to Bidders, Contractor's Certificate of Workers' Compensation, Insurance Certificates, Abbreviations and Definitions, General Conditions, Plans, Drawings, Specifications, Scope of Work, Addenda and Change Orders, all documents contained in the Project Manual and all modifications and amendments to the above. The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all.

2. The Work: Contractor shall perform everything required to be performed within the time set forth in Paragraph 5 of this Agreement, and shall provide and furnish all the labor, materials, necessary tools, expendable equipment, and all utility and transportation services as described in the Contract and required for construction of:

PROJECT LOCATION: El Dorado County, California;

PROJECT NAME: **Grizzly Flats CSD Clearwell Replacement Project**, ("PROJECT" or "WORK"), as set forth more fully in the Construction Documents, Scope of Work, Plans, Drawings, Specifications and Project Manual.

All of the Work to be performed and materials to be furnished shall be completed in a good workmanlike manner in strict accordance with the Drawings, Specifications, Scope of Work, and all other provisions of the Contract Documents. Contractor shall not be excused with respect to any failure to so comply with the Contract by any act or omission of Owner, Owner's consultant, agent, inspector, or representative of any of them.

The Project shall be furnished, performed and completed as required in the Drawings, Specifications, Scope of Work, and all other Contract Documents under the direction and supervision of and subject to the approval of Owner. Owner shall have the right to accept or reject materials or workmanship and to determine when Contractor has complied with the conditions of the Contract. The Building Inspector employed by Owner shall represent Owner.

3. Contract Amount: Owner shall pay to Contractor, as full consideration for the faithful performance of the contract, subject to any additions or deductions as provided in the Contract Documents, the sum of **$ _____.**

4. Payments: The price to be paid to Contractor under this Agreement shall be paid in legally executed and regularly issued warrants of Owner drawn on the appropriate fund or funds as required by law. Payments shall be made pursuant to the Schedule attached hereto as Exhibit "A." Payments shall be made for the portions of the Project as construction of the Project is completed, but the payment of progress payments by Owner shall not be construed as acceptance of the work done up to the time of such payments. All payments shall be subject to the final bid price set forth in the Cost Schedule.

5. Time for Completion: The Project shall be commenced within five (5) days of issuance by Owner of the Notice to Proceed and shall be completed within **180 calendar days from the Notice to Proceed**.

6. Liquidated Damages: If the Work is not completed in accordance with Paragraph 5 above, the parties agree that Owner will suffer damage. It being impractical and infeasible to determine the amount of actual damage, Contractor (or Surety) shall pay to Owner as fixed and liquidated damages, and not as a penalty, the sum of **$500.00** for each calendar day of delay until the Project is completed and accepted. This amount may be deducted from any payments due to or to become due to Contractor.

7. Interpretation of Contract Documents: Should any question arise concerning the intent or meaning of drawings or specifications, such question shall be submitted to Owner and its interpretation shall be final.

8. Extra or Additional Work and Changes: Should Owner at any time during the progress of the work request any alterations, deviations, additions, or omissions from the Contract specification or plans, it shall be at liberty to do so and the same shall in no way affect or make void the Contract, but the fair and reasonable value of such alterations, deviations, additions, or omissions will be added to or deducted from the amount of said Contract price as the case may be.

All change orders shall be signed by Owner. The value of any such extra work or changes shall be determined in one or more of the following ways:

a) By estimate and acceptance in a lump sum.

b) By unit prices named in the contract or subsequently agreed upon.

c) By cost and percentage or by cost and fixed fee.

9. Prosecution of Work: If, in the opinion of Owner, Contractor neglects to prosecute the work properly or fails to perform any provisions of the Contract, Owner,

after ten (10) days written notice to Contractor may, without prejudice to any other remedy it may have, remedy any such deficiencies and may deduct the cost therefor from any payment then or thereafter due Contractor, provided that the parties have used proper documentation and negotiations for a fair and equitable resolution.

10. Assignment of the Contract: Assignment of the Contract or any part thereof shall be prohibited without the prior written consent of Owner.

11. Indemnification: With the exception that this section shall in no event be construed to require indemnification by Contractor to a greater extent than permitted by law and in conjunction with section 5.53 of the General Conditions, Contractor shall defend, indemnify and save harmless Owner, including its officers, directors, agents, and employees, and each of them ("Indemnitees"), from any and all claims, demands, causes of action, damages, costs, expenses, actual attorneys' fees, losses or liabilities, in law or in equity, of every kind and nature whatsoever for claims arising out of or in connection with Contractor's performance of this contract.

A. Bodily injury including, but not limited to, bodily injury, sickness or disease, emotional injury or death to persons, including, but not limited to, the public, any employees or agents of Contractor, Owner, or any other Contractor and;

B. Damage to property of anyone including loss of use thereof; caused or alleged to be caused in whole or in part by any negligent or otherwise legally actionable act or omission of Contractor or anyone directly or indirectly employed by Contractor or anyone for whose acts Contractor may be liable.

Except as otherwise provided by law, the indemnification provisions above shall apply regardless of the existence of fault or degree of fault of Indemnitees. Contractor, however, shall not be obligated to indemnify Indemnitees for Claims arising from conduct delineated in Civil Code § 2782.

Contractor's obligation to defend and indemnify shall not be excused because of Contractor's inability to evaluate liability or because Contractor evaluates liability and determines that Contractor is not liable to the claimant. Contractor shall respond within 30 days to the tender of any claim for defense and indemnity by the State, unless this time has been extended by the State. If Contractor fails to accept or reject a tender of defense and indemnity within 30 days, in addition to any other remedy authorized by law, so much of the money due Contractor under and by virtue of the contract as shall reasonably be considered necessary by Owner, may be retained by Owner until disposition has been made of the claim or suit for damages, or until Contractor accepts or rejects the tender of defense, whichever occurs first.

With respect to third party claims against Contractor, Contractor waives any and all rights of any type to express or implied indemnity against Owner, its officers, employees, or agents (excluding agents who are design professionals).

12. Insurance: Prior to commencing the Work, Contractor shall obtain and maintain during the life of this contract, and shall require all Subcontractors, if any, whether primary or secondary, to take out and maintain insurance coverage as required by Section 1.52 of the General Conditions.

13. Bonds: Three (3) executed copies of this Agreement, Insurance Certificates, the Performance Bond, and the Payment Bond shall be provided by Contractor. Only bonds executed by admitted Surety insurers as defined in Code of Civil Procedure § 995.120 shall be accepted. Surety must be a California-admitted surety and listed by the U.S. Treasury with a bonding capacity in excess of the Project cost.

14. Clauses Included: Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included.

15. Eligible Contractors: Contractor acknowledges that, pursuant to Public Contract Code § 6101, no public works or purchase contract shall be awarded to a Contractor, nor shall a Contractor be eligible to receive a public works or purchase contract, who has, in the preceding five years, been convicted of violating a state or federal law respecting the employment of undocumented aliens. Contractor acknowledges that pursuant to Public Contract Code § 6101 no public works or purchase contract shall be awarded to a Contractor, nor shall a Contractor be eligible to receive a public works or purchase contract who has been found to have violated with intent to defraud a public agency while performing a public works project.

Contractor further acknowledges that, pursuant to Labor Code § 6109, Contractor is prohibited from performing work on a public works project with a subcontractor who is ineligible to perform work on the public works project pursuant to Labor Code § 1777.1 or § 1777.7**.** The Labor Commissioner publishes a list of ineligible contractors and subcontractors and distributes the list to awarding bodies under Labor Code § 1777.1.

16. Family Support Enforcement: Contractor acknowledges that pursuant to Public Contract Code § 7110 it shall fully comply with all applicable state and federal laws relating to child and family support enforcement, including, but not limited to disclosure of information and compliance with earnings assignment orders, as provided in Family Code Division 9, Part 5, Chapter 8 (commencing with § 5200). Contracts in excess of one hundred thousand dollars ($100,000.00) require an acknowledgement by Contractor of the policy set forth in Public Contract Code § 7110 and Contractor further acknowledges that it is fully complying with the earnings assignment orders of all employees and is providing the names of all new employees to the New Hire Registry maintained by the Employment Development Department.

17. Performance During Working Hours: Work shall be performed during regular working hours except that in the event of an emergency or when required to complete the Work in accordance with job progress, work may be performed outside of regular working hours with the advance written consent of Owner.

18. Labor Code Application: As provided in Labor Code §§ 1810 et seq., eight (8) hours of labor shall constitute a legal day's work. The time of service of any worker employed at any time by Contractor or by any Subcontractor on any subcontract under this Contract, upon the work or upon any part of the work contemplated by this Contract, is limited and restricted to eight (8) hours during any one calendar day and forty (40) hours during any one calendar week, except as hereinafter provided. Notwithstanding the provision hereinabove set forth, work performed by employees of Contractors in excess of eight (8) hours per day and forty (40) hours during any one week shall be permitted upon this public work provided that compensation for all hours worked in excess of eight (8) hours per day shall be compensated at not less than one and one-half (1½) times the basic rate of pay.

Contractor shall pay to Owner a penalty of Twenty-five Dollars ($25.00) for each worker employed in the execution of this Contract by Contractor, or by any Subcontractor, for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any calendar day and forty (40) hours in any one (1) calendar week, in violation of the provisions of Labor Code Division 2, Part 7, Chapter 1, Article 3 (commencing at § 1810), unless compensation for the workers so employed by Contractor is not less than one and one-half (1½) times the basic rate of pay for all hours worked in excess of eight (8) hours per day.

19. Prevailing Wage Rates: Pursuant to the provisions of Labor Code §§ 1770 et seq., Contractor shall pay the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this public work is to be performed for each craft, classification, or type of worker needed for this Project. The prevailing wage rates are available from the Director of the Department of Industrial Relations ("Director"). Contractor shall post a copy of such wage rates at the work site. Holiday and overtime work, when permitted by law, shall be paid for at the rate of at least one and one-half (1½) times the above specified rate of *per diem* wages, unless otherwise specified.

20. Forfeiture and Payments for Breach of Prevailing Wage Rates: In the event of a breach of prevailing wage, as a penalty to Owner pursuant to Labor Code § 1775, Contractor shall forfeit Fifty Dollars ($50.00) for each calendar day, or portion thereof, for each worker paid less than the prevailing rate of *per diem* wages, determined by the Director, for such craft or classification in which such worker is employed for any public work done under the Agreement by Contractor or by any Subcontractor under it. The amount of the penalty shall be determined by the Labor Commission and shall be based on consideration of Contractor's mistake, inadvertence, or neglect in failing to

pay the correct prevailing rate of *per diem* wage, the previous record of Contractor in meeting its prevailing rate of *per diem* wage obligations, or Contractor's willful failure to pay the correct prevailing rate of *per diem* wages. A mistake, inadvertence, or neglect in failing to pay the correct prevailing rate of *per diem* wage is not excusable if Contractor had knowledge of it or the obligations under this part. The difference between such prevailing rate of *per diem* wage and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the prevailing rate of *per diem* wage shall be paid to each worker by Contractor. *Per diem* wages are deemed to include those benefits set forth in Labor Code § 1773.1.

21. Contractor to Comply with Labor Code § 1777.5 et seq.: It shall be Contractor's responsibility to know and abide by the requirements of Labor Code §§ 1777.5 et seq. which include, but are not limited to, the requirement to hire apprentices on a public works project.

22. Contractor to Comply with Labor Code § 1776: It shall be Contractor's responsibility to know and abide by the requirements of Labor Code § 1776, which include, but are not limited to, the requirement to keep accurate payroll records that shall be available for inspection. In order to comply with Labor Code § 1776, the records must include: names, addresses, Social Security numbers, work classifications, straight time, overtime, and any per diem. In addition, the records must be verified by a declaration under penalty of perjury that the records are true and correct, and that the employer has complied with Labor Code §§ 1771, 1811 and 1815.

23. Non-discrimination. During the performance of this contract, Contractor and its subcontractors shall not unlawfully discriminate against any employee or applicant for employment because of race, religion, color, national origin, ancestry, physical handicap, medical condition, marital status, age (over 40) or gender.

Contractor and subcontractors hereby agree to ensure that the evaluation and treatment of their employees and applicants for employment are free of such discrimination. Contractors and subcontractors agree to comply with the provisions of the Fair Employment and Housing Act (Government Code § 12900 et seq.) and the applicable regulations promulgated under California Administrative Code, Title 2, § 7285.0 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code § 12900, set forth in California Administrative Code, Title 2, Division 4, Chapter 5 are incorporated into this contract by reference and made a part hereof as if set forth in full. Contractor and its subcontractors agree to give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.

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

25. Notices

Any notice, demand, invoice or other communication required or permitted to be given under this Agreement shall be in writing and either served personally or sent by prepaid, first class U.S. Mail and addressed as set forth below. Any party may change its address by notifying the other party in writing of the change of address.

OWNER: CONTRACTOR:

25. **THE COMPLETE CONTRACT AS SET FORTH IN PARAGRAPH 1 OF THIS AGREEMENT CONSTITUTES THE ENTIRE AGREEMENT OF THE PARTIES. NO OTHER AGREEMENTS, ORAL OR WRITTEN, PERTAINING TO THE WORK TO BE PERFORMED UNDER THIS CONTRACT, EXISTS BETWEEN THE PARTIES. THIS CONTRACT CAN BE MODIFIED ONLY BY AN EXECUTED WRITTEN AGREEMENT APPROVED BY THE GOVERNING BOARD.**

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed.

OWNER CONTRACTOR

By _____ By _____

(Signature of OWNER representative) (Signature of CONTRACTOR)

CONTRACTOR's License No. _____

(CORPORATE SEAL of CONTRACTOR)

CONTRACT AGREEMENT

EXHIBIT "A"

SCHEDULE OF PAYMENTS

Owner shall make Payments for the Project Work in conformance with and subject to the terms and conditions for payments as set forth below and in the Construction Agreement, if applicable.

_____% due _____

_____% due _____

_____% due _____

_____% due _____

_____% due _____

_____% due 60 days after Owner's acceptance and approval of final Project.

Note: Owner shall withhold at least 5% of total labor and materials until final completion and acceptance of the Project. On the expiration of sixty (60) days after the recordation of the Notice of Completion all monies due and payable to Contractor shall be paid, subject to the provisions of Section 5.62 herein.

3.4 CONTRACTOR'S CERTIFICATE REGARDING WORKER'S COMPENSATION

To: _____

THE UNDERSIGNED STATES AND DECLARES THAT:

We are aware of the provisions of § 3700 of the Labor Code which require every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that code, and we will comply with such provisions before commencing the performance of the work of this contract.

CONTRACTOR

(Company Name)

(State of Incorporation, if Corp.)

(Authorized Signature)

(Name)

(Title)

Address:

Phone Number:

3.5 NOTICE OF AWARD

To: _____

Project Description: Clearwell Replacement Project

The _____ ("Owner") has considered the Bid Proposal submitted by you for the above described project dated _____.

You are hereby notified that your Bid Proposal has been accepted for the following Work items: _____,

in the amount of $ _____.

You are required by the Information for Bidders to execute the Agreement and furnish the required Faithful Performance Bond, Payment Bond and certificates of insurance within fifteen (15) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said bonds within fifteen (15) days from the date of this Notice, said Owner will be entitled to consider all your rights arising out of Owner's acceptance of your Bid as abandoned. Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to Owner.

Dated this _____ day of _____ 20___.

[OWNER]

By:_____

Title:_____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by this the _____ day of _____, 20____.

By:_____

Title:_____

3.6 NOTICE TO PROCEED

To: _____ **Date:**_____

PROJECT: Clearwell Replacement Project

In accordance with the Agreement dated _____, 20_____, you are hereby notified to commence work within five (5) days and you are to complete the work within _____ **( ) consecutive calendar days** thereafter. The date of completion of all work is therefore 20___.

[OWNER]

By:_____

` Title:_____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by

this the _____ day of _____ 20_____.

By:_____

Title:_____

SECTION 4. ABBREVIATIONS, ACRONYMS AND DEFINITIONS

4.1 ABBREVIATIONS and ACRONYMS

4.1.1 Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

4.2 DEFINITIONS

For purposes of the Contract Documents, these words and phrases shall be defined as follows:

4.2.1 **Acceptance** means the formal written acceptance by Owner of the entire Contract which has been completed in all respects, in accordance with the Specifications and any approved modifications.

4.2.2 **Owner's Engineer** means Owner's Engineer or engineer retained by Owner, or the person designated by Owner as its engineering representative during the course of construction, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties delegated to them.

4.2.3 **Owner** means **Grizzly Flats Community Services District**.

4.2.4 Omitted.

4.2.5 **Bid** means the offer of the bidder for the work when made out and submitted on the prescribed bid form, properly completed, signed and guaranteed.

4.2.6 **Bid Bond** means the cash, cashier's check, certified check, or bidder's bond accompanying the bid submitted by the bidder, as a guarantee that the bidder will enter into a Contract with Owner for the performance of work herein described.

4.2.7 **Bidder** means any individual, firm, partnership or corporation submitting a bid for the work contemplated, and acting directly or through a duly authorized representative.

4.2.8 **Board of Directors** or **Board** means the Board of Directors of Owner.

4.2.9 **City or Town** means the city or town of **GRIZZLY FLATS**.

4.2.10 **Contract** means the written agreement covering the performance of the work and the furnishing of labor, materials, tools and equipment in the construction of the work. The Contract shall include all Contract Documents.

4.2.11 Contract Documents means any or all of the documents contained in the Project Manual, the Contract Agreement, the Plans and Specifications and all supplemental agreements amending or extending the work, which may be required to complete the work in a substantial and acceptable manner. Supplemental agreements are written agreements covering alterations, amendments or extensions to the Contract Documents, and include without limitation Addenda and Contract Change Orders.

4.2.12 Contractor means the person or persons, firm, partnership or corporation or other entity that has entered into the Contract with Owner to perform the work.

4.2.13 County means County of **El Dorado**, California.

4.2.14 Date of the Contract means the date on which the Contract is signed by Owner's authorized representative.

4.2.15 Datum means the figures given in the Specifications or upon the Drawings after the word "Elevation" or an abbreviation of it.

4.2.16 Days mean calendar days unless otherwise designated.

4.2.17 Omitted.

4.2.18 He shall include "she" and "it" and his shall include "her" and "its."

4.2.19 Or Equal shall be understood to indicate that the "equal" product be the same or better than the product named, in function, performance, reliability, quality, and general configuration. Determination of equality in reference to the project design requirements will be made by Owner's Engineer.

4.2.20 Plans or **Drawings** refers to the official plans, drawings, profiles, cross sections, elevations, details, and other working drawings and supplementary drawings, or reproductions thereof, signed by Owner's Engineer, which show the location, character, dimensions, and details of the work to be performed. Plans may either be bound in the same book as the balance of the Contract Documents or bound in separate sets, and are a part of the Contract Documents, regardless of the method of binding.

4.2.21 Project means the **GRIZZLY FLATS CSD CLEARWELL REPLACEMENT PROJECT.**

4.2.22 Specifications means the terms, provisions, and requirements contained herein and identified in the Project Manual, Volumes I and II, and is synonymous with "Technical Specifications." Where standard specifications, such as those of "ASTM", "AASHO", etc. have been referred to, the applicable portions of such standard specifications shall become a part of these Contract Documents.

4.2.23 State means State of California.

4.2.24 State Standard Specifications mean the edition in effect as of the Date of Execution of the Contract of the Standard Specifications issued by the State of California

Business and Transportation Agency, Department of Transportation, unless a specific edition is referenced.

4.2.25 Subcontractor means only those persons, firms or entities having a direct contract with Contractor, and it includes one who furnishes material worked to a special design according to the Plans or Specifications, but does not include one who merely furnishes material not so worked and would be considered a supplier only.

4.2.26 Time Limits mean all time limits stated in the Contract Documents, and all time limits are of the essence of the Contract.

4.2.27 Work means all the work specified, indicated, shown or contemplated in the Contract Documents to construct the improvements, including all alterations, amendments or extensions thereto made by Contract Change Order or other written orders of Owner's Engineer.

SECTION 5. GENERAL CONSTRUCTION PROVISIONS

5.1 INTENT OF CONSTRUCTION PROVISIONS

5.1.1 The intent of the Construction Provisions is to prescribe the details for the construction and completion of the work which Contractor undertakes to perform pursuant to this Agreement ("Work"). Where the Specifications and Plans describe portions of the work in general terms, but not in complete detail, it is understood that only the best general practice is to prevail and that only materials and workmanship of the first quality are to be used. Unless otherwise specified, Contractor shall furnish all labor, materials, tools, equipment and incidentals and do all the work involved in completing the Project in a satisfactory and workmanlike manner.

5.1.2 The technical specifications are presented in sections for convenience. However, this presentation does not necessarily delineate trades or limits of responsibility. All sections of the Specifications and Plans are interdependent and applicable to the project as a whole.

5.1.3 The Construction Provisions are complementary, and what is called for in any one shall be as binding as if called for in all. In the event of a conflict of the provisions of the Specification Sections and these General Conditions, the Specification Sections shall control.

5.2 CONTRACTOR'S UNDERSTANDING

It is understood and agreed that Contractor has, by careful examination, satisfied itself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions, and all other matters which can in any way affect the

work under this Agreement. No verbal agreement or conversation with any officer, agent or employee of Owner, either before or after the execution of this Agreement, shall affect or modify any of the terms or obligations herein contained.

5.3 CHANGES IN THE WORK

5.3.1 General. Owner may, at any time, by written order make changes in the work as deemed necessary by Owner.

5.3.2 Minor Changes. Owner shall have the authority to order minor changes in the work not involving any increase or decrease in Contractor's cost or time required for performance of the Work. Such minor changes shall be effected by written order of Owner and Contractor shall carry out such written orders promptly. If Contractor disagrees with Owner's determination that the minor change does not involve any increase or decrease in Contractor's cost or time required for performance of the Work, then Contractor may file and pursue a claim pursuant to section 5.4. The written claim must be submitted to Owner within **10 calendar** days after the date of Owner's written order.

5.3.3 Change Orders.

5.3.3.1 Owner may, from time to time, issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the contract cost or the contract time.

5.3.3.2 Owner-initiated Change Orders. If any change in the work ordered by Owner causes an increase or decrease in Contractor's cost or time required for performance of the Work, an adjustment and modification of the payment will be made in the form of a Change Order issued by Owner which will set forth (a) a description of the changes, additions and/or deductions in the work to be done, (b) the increase or decrease in compensation due Contractor, if any, or the method by which the increase or decrease, if any, will be calculated, and (c) the adjustment in the time of completion of the work, if applicable. A Change Order may be issued to Contractor at any time.

5.3.3.3 Contractor-initiated Change Orders. If conditions require modifications to the Work, Contractor may initiate a claim by submitting a request for a change setting forth (a) a description of the changes, additions and/or deductions in the work to be done, (b) the increase or decrease in compensation due Contractor, if any, including costs of labor and supervision directly attributable to the change, quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made, applicable taxes, delivery charges, equipment rental, amounts of trade discounts or the method by which the increase or decrease, if any, will be calculated, and any other associated costs, and (c) the adjustment in the time of completion of the work, if applicable.

5.3.4 Change Order-Cost Adjustment. The compensation to be paid for any work addressed in a Change Order shall be determined in one or more of the following ways as shown in the Change Order:

5.3.4.1 By unit prices;

5.3.4.2 By an agreed-upon lump sum; or

5.3.4.3 By the cost-plus basis determined pursuant to section 5.3.9.

5.3.5 Cost Records. Contractor shall keep full and complete records of the cost of any work addressed in a Change Order in the form and manner prescribed by Owner and shall permit Owner to have access to such records as may be necessary to assist in the determination of the compensation payable for such work.

5.3.6 Cost Reduction for Deductive Change Order. With respect to a Change Order involving the deletion or reduction of work, Owner shall determine the appropriate reduction in the payment due, based on the lump sum and/or per unit prices in the bid schedule for the items of work deleted or reduced by the Change Order. Contractor shall not be entitled to claim damages for anticipated profits on any portion of the work that may be deleted.

5.3.7 Proposed Change Order. Upon receipt of a Change Order signed by Owner, Contractor shall forthwith proceed with the ordered work, unless otherwise directed by Owner. If Contractor agrees with the terms and conditions of the Change Order, then it shall sign the Change Order.

5.3.8 Contractor Protest Against Change Order. Should Contractor disagree with any terms or conditions set forth in a proposed Change Order, it shall submit a written protest to Owner within 15 days after the receipt of the proposed Change Order. The protest shall state the points of disagreement, addressing, if applicable, the quantities and cost involved and the adjustment of time for completion.

5.3.8.1 If a written protest is not timely submitted by Contractor, then the proposed Change Order, including all cost and time adjustment provisions, if any, that was submitted to Contractor shall be deemed final and acceptable to Contractor even if not signed by Contractor. Any payment under an unprotested Change Order's cost adjustment provisions shall constitute full compensation for all work included in or required by the Change Order.

5.3.8.2 If Contractor timely protests a proposed Change Order, it shall nevertheless proceed with the ordered work pending resolution of the protest.

5.3.8.3 If Contractor timely protests a proposed Change Order, Owner shall render in writing its determination of the protest. If Contractor disputes the determination, then Contractor may file and pursue a claim pursuant to section 5.4. The written claim must be submitted to Owner within 15 days after the date of Owner's written determination on the protest. If Contractor does not timely file a claim, then the

proposed Change Order (as may have been revised by Owner's determination on the protest), including all cost and time adjustment provisions, if any, shall be deemed final and acceptable to Contractor even if not signed by Contractor. Any payment under such a Change Order's cost adjustment provisions shall constitute full compensation for all work included in or required by the Change Order.

5.3.9 Cost-Plus Basis of Payment on Change Orders. The following shall constitute the cost-plus basis of payment:

5.3.9.1 Direct Labor Cost. Charges for all of the labor furnished and used by Contractor shall be made for manual classifications up to and including general foreman. It will not include charges for assistant superintendents, superintendents, office personnel, timekeepers and maintenance mechanics. The time charged to work shall be subject to the daily approval of Owner and evidence of such daily approval shall be submitted with the billing. Labor rates used to calculate the costs shall be those basic wages including current employer contributions for fringe benefits and federal and state surcharges and including applicable subsistence and travel allowances, all as actually paid to workers under collective bargaining agreements or as a regular practice of the employer. No time or charges will be allowed except when the workers are actually engaged in the proper, efficient and diligent performance or completion of the work as authorized. Overtime shall not be worked without prior approval of Owner.

5.3.9.2 Equipment Cost. Charges for the rental and operation of the equipment furnished and used by Contractor shall be made for all prime construction and automotive equipment. It shall not include charges for listed equipment or major tools with a new cost of $500 or less. Equipment time charges shall be subject to the daily approval of Owner and evidence of such daily approval shall be submitted with the billing. The equipment rental and operation rates used shall be those agreed upon by Owner and Contractor prior to commencement of the work and shall include an approved allowance for depreciation. Time and charges shall be allowed only when equipment is actually being used for the proper and efficient performance or completion of the work as authorized.

5.3.9.3 Material Costs. Charges for the cost of materials furnished by Contractor shall be made, provided such furnishing was specifically authorized in the work order and the actual use verified by Owner. Charges shall be net cost to Contractor delivered at the job, including all applicable sales taxes; and a vendor's invoice must accompany the billing along with verification of use of such materials by Owner.

5.3.9.4 Tools, Supplies, Supervision, Overhead and Profit. A charge for major tools, supplies, overhead, supervision and profit will be allowed in the amount of 15% of the total direct labor costs, equipment costs, and material costs, as defined above at sections 5.3.9.1 to 5.3.9.3.

5.3.9.5 Work by Subcontractor. When all or any part of the work is performed by any of Contractor's subcontractors, the markup percentage established in section

5.3.9.4 shall be applied to the subcontractor's actual cost of such work (determined as above at sections 5.3.9.1 to 5.3.9.3), to which a markup of 5% on the subcontracted portion of the extra work may be added by Contractor.

5.3.10 Effect of Change on Bond Sureties. The consent of Contractor's bond sureties shall not be required as to any change or extra work ordered by Owner and the liability of Contractor's bonds and sureties shall be increased or decreased accordingly without notice to the sureties.

5.3.11 Right to Use Other Contractors. Owner reserves the right to contract with any person or firm other than Contractor for any or all extra work.

5.3.12 Increased Quantity of Project Items. If the total pay quantity of any item of work required under the Agreement to be paid at a unit price exceeds by more than 25 percent the item as bid, then in the absence of an executed change order specifying the compensation to be paid, the work in excess of 125 percent of such estimate may, at Owner's discretion, be paid for by a cost-plus basis of payment as described at section 5.3.9, instead of at the unit price.

5.4 CONTRACTOR CLAIMS FOR EXTRA COSTS AND TIME EXTENSIONS

5.4.1 General. The parties intend by this section that differences between the parties, arising under and by virtue of this Agreement, be brought to Owner's attention at the earliest possible time in order that such matters may be settled or other appropriate action promptly taken.

5.4.2 Waiver. Contractor agrees that it shall not be entitled to any additional time to complete work or the payment of any additional compensation for any claim, cause, act, failure to act, or happening of any event, thing or occurrence, unless it shall have given Owner timely and due written notice of the claim pursuant to this section 5.4, provided, however, that compliance with this section shall not be a prerequisite as to matters within the scope of the protest provisions in section 5.3.8. Contractor shall not be entitled to any additional compensation for claimed extra work until and unless either a Change Order has been issued pursuant to section 5.3 or a claim has been timely filed and approved pursuant to this section 5.4. If Contractor fails to file a written claim within the claim deadline of section 5.4.5, then Contractor agrees that it shall have waived any right or remedy to thereafter pursue the claim against Owner in any administrative, arbitration or litigation proceeding.

5.4.3 Definition. A claim for purposes of this section 5.4 means a separate demand by Contractor for (a) a time extension, (b) payment of money or damages arising from work done by, or on behalf of, Contractor and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or (c) an amount the payment of which is disputed by Owner.

5.4.4 Informal Claims Resolution. The parties shall strive to resolve all disputes amicably and in an informal manner. Any dispute resolved informally shall be

documented by Owner and if the resolution involves a change in the project work, increase or decrease in the compensation due Contractor or adjustment in the time of completion of the work, then the dispute resolution shall be confirmed by a Change Order pursuant to section 5.3. Informal discussions or negotiations with Owner's representatives concerning informal resolution of a dispute shall not toll or suspend the claim filing deadlines provided below, except by Owner's written agreement.

5.4.5 Deadlines for Filing of Claim. Contractor may file a claim with Owner subject to the terms, conditions and deadlines of section 5.4. A claim must be submitted to Owner: (a) if a deadline is set forth in the Construction Provisions for filing of the particular claim, the claim must be filed by the specified time; (b) if the claim relates to extra, additional or unforeseen work for which Contractor intends to demand additional compensation or a time extension, notice shall be given to Owner prior to Contractor's commencement of performance of the work giving rise to the claim and Contractor shall not proceed with said work until so directed by Owner; and (c) for all other claims not included within subsections (a) and (b), the claim must be filed on or before 15 days after occurrence of the event giving rise to the claim. In no event shall claims be filed later than the date of final payment.

5.4.6 Emergency Work. In the event of an emergency endangering life or property, Contractor shall act as provided by section 5.54.7. After completion of the necessary emergency work Contractor shall present to Owner an accounting of labor, materials and equipment in connection therewith. The procedure for any payment that may be due for emergency work will be as specified in section 5.3.

5.4.7 Tort Claims. The provisions of sections 5.4 to 5.6 apply only to contract claims. They do not apply to tort claims, and nothing in these sections is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Government Code §§ 900 et seq. and 910 et seq.

5.4.8 Required Contents of Claim. The claim shall be in writing, shall set forth in detail the reasons Contractor believes additional compensation or a time extension will or may be due, the documents necessary to substantiate the claim, the nature of the costs involved, and, insofar as possible, the amount of the claim.

5.4.9 Project Work Pending Claim Resolution. Unless otherwise directed in writing by Owner, pending resolution of a claim under this section 5.4, Contractor shall continue to diligently prosecute the Project work in accordance with the Construction Provisions and the instructions of Owner.

5.4.10 Processing of Claims by Owner. Generally, except as otherwise specifically provided in the Construction Provisions, Owner will initially decide all claims of Contractor and all disputes arising under and by virtue of this Agreement. All such decisions of Owner shall be final unless disputed by Contractor in accordance with section 5.4.12 or section 5.6.2, as appropriate. If Contractor fails to dispute Owner's decision on the matter in accordance with section 5.4.12 or section 5.6.2, then Owner's

decision shall be final, conclusive, and binding, and Contractor shall be deemed to have waived all its rights to further protest, judicial or otherwise. Any claim for a time extension or claim for money or damages of less than $375,000 (i.e., any claim subject to Public Contract Code § 20104) shall be processed by Owner and resolved in accordance with sections 5.4.11 to 5.5. Any claim for money or damages of more than $375,000 (i.e., any claim not subject to Public Contract Code § 20104) shall be processed by Owner and resolved in accordance with section 5.6.

5.4.11 Owner Response to Claim.

5.4.11.1 For a claim for a time extension or claim for money or damages of less than $50,000, Owner shall respond in writing to any written claim within 45 days of receipt of the claim by Owner, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim Owner may have against Contractor. If additional information is thereafter required, it shall be requested and provided pursuant to this section, upon mutual agreement of Owner and Contractor. Owner's written response to the claim, as further documented, shall be submitted to Contractor within 15 days after receipt of the further documentation or within a period of time no greater than that taken by Contractor in producing the additional information, whichever is greater.

5.4.11.2 For claims of over $50,000 and less than or equal to $375,000, Owner shall respond in writing to all written claims within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim Owner may have against Contractor. If additional information is thereafter required, it shall be requested and provided pursuant to this section, upon mutual agreement of Owner and Contractor. Owner's written response to the claim, as further documented, shall be submitted to Contractor within 30 days after receipt of the further documentation, or within a period of time no greater than that taken by Contractor in producing the additional information or requested documentation, whichever is greater.

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

5.4.13 Government Code Claim. Following the meet and confer conference, if the claim or any portion remains in dispute, Contractor may file a claim as provided in Government Code §§ 900 et seq. and 910 et seq. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time Contractor submits a timely written claim pursuant to subsection 5.4.5 until the time that the claim is denied as a result of the meet and confer process, including any

period of time utilized by the meet and confer process; provided that if Contractor fails to demand a meet and confer conference within the applicable 15 day period, then Contractor shall be deemed not to dispute Owner's written response to the claim and any tolling of the running of the period of time within which a Government Code claim must be filed (see Public Contract Code § 20104.2(e) shall cease upon expiration of the applicable 15 day period.

5.5 SPECIAL LITIGATION PROVISIONS

The following procedures shall apply to all civil actions filed to resolve claims subject to Public Contract Code § 20104 (i.e., any claim for a time extension or claim for money or damages of less than $375,000).

5.5.1 Mediation. Within 60 days, but no earlier than 30 days, following the filing of responsive pleadings, the court shall submit the matter to non-binding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

5.5.2 Arbitration.

5.5.2.1 If the matter remains in dispute, the case shall be submitted to Judicial arbitration pursuant to Code of Civil Procedure Title 3, Part 3, Chapter 2.5 (commencing with § 1141.10), notwithstanding § 1141.11 of that code. The Civil Discovery Act of l986 (Code of Civil Procedure title 3, part 4, chapter 3, article 3 (commencing with § 2016)) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

5.5.2.2 Notwithstanding any other provision of law, upon stipulation of the parties, arbitrators appointed for purposes of this article shall be experienced in construction law, and, upon stipulation of the parties, mediators and arbitrators shall be paid necessary and reasonable hourly rates of pay not to exceed their customary rate, and such fees and expenses shall be paid equally by the parties, except in the case of arbitration where the arbitrator, for good cause, determines a different division. In no event shall these fees or expenses be paid by state or county funds.

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

5.5.3 Witnesses. The court may, upon request by any party, order any witnesses to participate in the mediation or arbitration process.

5.5.4 Payment of Undisputed Claims. Owner shall not fail to pay money as to any portion of a claim that is undisputed except as otherwise provided in the Construction Provisions.

5.5.5 Interest. In any suit filed under this section 5.5, Owner shall pay interest at the legal rate on any arbitration award or judgment. The interest shall begin to accrue on the date the suit is filed in a court of law.

5.6 LARGE CLAIM RESOLUTION

For any claim for money or damages of more than $375,000 (i.e., any claim not subject to California Public Contract Code § 20104), the following requirements apply:

5.6.1 Owner Response to Claim. Owner shall respond in writing to the written claim within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim that Owner may have against Contractor. If additional information is thereafter required, it shall be requested and provided pursuant to this section, upon mutual agreement of Owner and Contractor. Owner's written response to the claim, as further documented, shall be submitted to Contractor within 30 days after receipt of the further documentation.

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

5.6.3 Lawsuit on the Claim. Following the meet and confer conference, if the claim or any portion remains in dispute, Contractor may, within six (6) months from the date of the last meet and confer conference, file a lawsuit on the claim. If Contractor fails to demand a meet and confer conference as described in section 5.6.2, Contractor may, within six (6) months from the date of Owner's written response, file a lawsuit on the claim. If Contractor fails to file a lawsuit within whichever six-month period is applicable, then Owner's written response to the claim shall be final, conclusive and binding on Contractor, and Contractor agrees that it thereafter shall be barred from filing a lawsuit on the claim.

5.7 GUARANTEE

5.7.1 In addition to warranties, representations and guarantees stated elsewhere in the Construction Provisions or implied-in-fact or in-law, Contractor unconditionally

guarantees all materials and workmanship furnished hereunder, and agrees to repair or replace or both at its sole cost and expense, and to the satisfaction of Owner, any and all materials which may be defective or improperly installed.

5.7.2 Contractor shall repair or replace to the satisfaction of Owner any or all such work that may prove defective in workmanship or materials, ordinary wear and tear excepted, together with any other work which may be damaged or displaced in so doing. Contractor shall leave the site of any such repair or replacement work in satisfactory working order and condition.

5.7.3 In the event of failure to comply with the above stated conditions within a reasonable time, Owner is authorized to have the defect repaired and made good at the expense of Contractor who will pay the costs and charges therefor immediately upon demand, including any reasonable management and administrative costs, and engineering, legal and other consultant fees incurred to enforce this section.

5.7.4 The signing of the Agreement by Contractor shall constitute execution of the above guarantees. Except as otherwise provided in this Agreement, the guarantees and warranties shall remain in effect for one year from the date of recording a notice of completion. This guarantee does not excuse Contractor from breaches of contract causing defects that occur or are discovered more than one year after the notice of completion. In addition, the warranty and guaranty period for repaired or replaced work or part shall be one year from the date of acceptance of said repaired or replaced work or part, but not less than the remaining warranty period of the original work.

5.8 AUTHORITY OF OWNER

5.8.1 Owner has full authority to interpret the Construction Provisions, to conduct the construction review and inspection of Contractor's performance, and to decide questions which arise during the course of the work; and its decisions on these matters shall be final and conclusive. Owner has the authority to reject all work and materials that do not conform to the Construction Provisions, and has the authority to stop the work whenever such stoppage may be necessary to insure the proper execution of the Agreement.

5.8.2 If at any time Contractor's work force, tools, plant or equipment appear to Owner to be insufficient or inappropriate to secure the required quality of work or the proper rate of progress, Owner may order Contractor to increase their efficiency, improve their character, to augment their number or to substitute other personnel, new tools, plant or equipment, as the case may be, and Contractor shall comply with such order. Neither the failure of Owner to demand such increase of efficiency, number, or improvement, nor the compliance by Contractor with the demand, shall relieve Contractor of its obligation to provide quality work at the rate of progress necessary to complete the work within the specified time.

5.8.3 Owner shall have the authority to make minor changes in the work, not involving extra costs, and not inconsistent with the purposes of the work.

5.8.4 Any order given by Owner, not otherwise required by the Contract Documents to be in writing shall, on request of Contractor, be given or confirmed by Owner in writing.

5.8.5 Whenever work, methods of procedure, or any other matters are made subject to direction or approval, such direction or approval will be given by Owner.

5.9 DRAWINGS

5.9.1 Owner will furnish Contractor, free of charge, copies of Contract Documents that are reasonably necessary for the execution of the work. Contractor shall have no claim for excusable delay on account of the failure of Owner to deliver such Drawings unless Owner shall have failed to deliver the same within two weeks after receipt of written demand therefor from Contractor. If Contractor, in the course of the work, finds any discrepancy between the Drawings and the physical condition of the locality, or any errors or omissions in the Drawings, or in the layout as given by points and instructions, it shall be its duty to inform Owner in writing, and Owner will promptly verify the same. Any work done after such discovery, until authorized, will be done at Contractor's risk. All Drawings, Specifications, and copies thereof furnished by Owner are the property of Owner and shall not be reused on other work and, with the exception of the signed sets for the implementation of this Agreement, are to be returned to it, on request, at the completion of the work. All models are the property of Owner.

5.9.2 Contractor shall maintain at the site of work one record copy of the Drawings, in good order, and available to Owner. Contractor shall mark the Drawings to record all changes and corrections made during construction. Contractor shall make all corrections and changes on the Drawings as necessary to produce accurate and complete record Drawings showing the "as built" work. Marked Drawings shall be updated at least weekly. Contractor shall submit to Owner a final, complete and accurate set of record Drawings prior to or simultaneously with Contractor's request for final payment.

5.9.3 The Drawings shall be supplemented by such shop drawings prepared by Contractor as are necessary to adequately control the work. Contractor shall not make any changes in any shop drawings after they have been reviewed by Owner.

5.9.4 Shop drawings for any structure shall include, but not be limited to: stress sheets, anchor bolt layouts, shop details, and erection plans, which shall be reviewed and approved by Owner before any such work is performed.

5.9.5 Shop drawings will be required for cribs, cofferdams, falsework, centering and form work and for other temporary work and methods of construction Contractor proposes to use. Such drawings shall be subject to the review and approval of Owner insofar as the details affect the character of the finished work, but details of design will be left to Contractor who shall be responsible for the successful construction of the work.

5.9.6 Contractor agrees that shop drawings processed by Owner are not Change Orders, and that the purpose of shop drawings submitted by Contractor is to demonstrate to Owner that Contractor understands the design concept, and to demonstrate its understanding by indicating which equipment and material it intends to furnish and by detailing the fabrication methods it intends to use.

5.9.7 It is expressly understood, however, that favorable review of Contractor's shop drawings shall not relieve Contractor of any responsibility for accuracy of dimensions and details, or for mutual agreements of dimensions and details. It is mutually agreed that Contractor shall be responsible for agreement and conformity of its shop drawings with the Specifications. Contractor further agrees that if deviations, discrepancies or conflicts between shop drawings and Specifications are discovered either prior to or after shop drawings are processed by Owner, the Specifications shall control and shall be followed.

5.9.8 Unless otherwise stated, Owner shall have 30 days from the date of receipt of shop drawings for review.

5.9.9 Full compensation for furnishing all shop drawings shall be considered as included in the prices paid for the items of work to which such drawings relate and no additional compensation will be allowed therefore. Any cost related to Owner's review of any particular set of shop drawings more than twice, due to incompleteness or unacceptability, shall be borne by Contractor, and Owner reserves the right to withhold such costs from payments due Contractor.

5.10 CONSTRUCTION STAKING AND SURVEYS

5.10.1 See General Notes on plans for project control responsibilities.

5.11 PERMITS AND REGULATIONS

5.11.1 Permits and licenses, of a temporary nature, necessary for the prosecution of the work shall be secured and paid for by Contractor. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by Owner unless otherwise specified.

5.11.2 Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as shown on the plans and described in

the Specifications. Contractor shall promptly notify Owner in writing of any specification at variance therewith and any necessary changes shall be adjusted as provided in the Construction Provisions for changes in the work. If Contractor performs any work knowing it to be contrary to such laws, ordinances, rules, and regulations and without such notice to Owner, it shall bear all costs arising therefrom.

5.12 CONFORMITY WITH CONSTRUCTION PROVISIONS

Work and materials shall conform to the lines, grades, cross sections, dimensions and material requirements, including tolerances, shown on Construction Provisions. Although measurement, sampling, and testing may be considered evidence as to such conformity, Owner shall be the sole judge as to whether the work or materials deviate from the Specifications and plans, and its decision as to any allowable deviations therefrom shall be final and conclusive.

5.13 COORDINATION AND INTERPRETATION OF CONSTRUCTION PROVISIONS

5.13.1 The Construction Provisions are complementary and a requirement occurring in one is as binding as though occurring in all.

5.13.2 In the event of conflict between the Plans and the Specifications, the Specifications shall govern, except that, where items are shown on the Plans and are not specifically included in the Specifications, the Plans shall govern.

5.13.3 Should it appear that the work to be done or any of the matters relative thereto are not sufficiently detailed or explained in the Specifications and Plans, Contractor shall apply to Owner for such further explanations as may be necessary and shall conform to them as part of the Agreement. In the event of any doubt or question arising respecting the true meaning of the Specifications and Plans, reference shall be made to Owner, whose decision thereon shall be final and conclusive.

5.13.4 In the event of any discrepancy between any Plans and the figures written thereon, the figures shall be taken as correct. Detailed drawings shall prevail over general drawings.

5.13.5 Any reference made in the Specifications or on the Plans to any specification, standard, method, or publication of any scientific or technical society or other organization shall, in the absence of a specific designation to the contrary, be understood to refer to the Specification, standard, method, or publication in effect as of the date that the work is advertised for Bids.

5.14 SUBCONTRACTS

5.14.1 The attention of Contractor is directed to California Public Contract Code § 4100, et seq., regarding subcontracting and said provisions are by this reference incorporated herein and made a part hereof.

5.14.2 Each subcontract shall contain a suitable provision for the suspension or termination thereof should the work be suspended or terminated or should the subcontractor neglect or fail to conform to every provision of the Construction Provisions insofar as such provisions are relevant. No subcontractor or supplier will be recognized as such, and all persons engaged in work will be considered as employees of Contractor, and Contractor will be held responsible for their work, which shall be subject to the provisions of the Construction Provisions. Contractor shall be fully responsible to Owner for the acts or omissions of its subcontractors and of the persons either directly or indirectly employed by them. Nothing contained in the Construction Provisions shall create any contractual relationship between any subcontractor and Owner. If a legal action, including arbitration or litigation, against Owner is initiated by a subcontractor or supplier, Contractor shall reimburse Owner for the amount of legal, engineering and all other expenses incurred by Owner in defending itself in said action.

5.14.3 Owner reserves the right to approve all subcontractors. Such approval shall be a consideration to the awarding of the Contract and unless notification to the contrary is given to Contractor prior to the signing of this Agreement, the list of subcontractors that is submitted with its proposal will be deemed to be acceptable.

5.15 COOPERATION OF CONTRACTORS

5.15.1 Should construction be under way by other forces or by other contractors within or adjacent to the limits of the work specified or should work of any other nature be under way by other forces within or adjacent to said limits, Contractor shall cooperate with all such other contractors or other forces or agents of Owner to the end that any delay or hindrance to their work will be avoided. The right is reserved by Owner to perform other or additional work at or near the site (including material sources) at any time, by the use of other contractors, forces or agents. Other contractors or agents of Owner will be involved in completing work in and around the Project and Contractor shall coordinate and work cooperatively with such other contractors or agents.

5.15.2 When two or more contractors are employed on related or adjacent work, each shall conduct its operation in such a manner as not to cause any unnecessary delay or hindrance to the other. Each contractor shall be responsible to the other for all damage to work, to persons or property caused to the other by its operations, and for loss caused the other due to its unnecessary delays or failure to finish the work within the time specified for completion.

5.16 SUPERINTENDENCE

5.16.1 Contractor shall designate in writing before starting work an individual as authorized representative who shall have the authority to represent and act for Contractor. This authorized representative shall be present at the site of the work at all times while work is actually in progress. When work is not in progress and during

periods when work is suspended, arrangements acceptable to Owner shall be made for any emergency work that may be required.

5.16.2 Contractor is solely responsible, at all times, for the superintendence of the work and for its safety and progress.

5.16.3 Whenever Contractor or its authorized representative is not present on any particular part of the work where it may be desired to give direction, orders will be given by Owner, which shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which the orders are given.

5.16.4 Any order given by Owner, not otherwise required by the Construction Provisions to be in writing, will on request of Contractor, be given or confirmed by Owner in writing.

5.17 INSPECTION OF WORK

5.17.1 Unless otherwise provided, all equipment, materials, and work shall be subject to inspection and testing by Owner. Owner will observe the progress and quality of the work and determine, in general, if the work is proceeding in accordance with the intent of the Construction Provisions. Owner shall not be required to make comprehensive or continuous inspections to check the quality of the work, nor shall it be responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the work. Visits and observations made by Owner shall not relieve Contractor of its obligation to conduct comprehensive inspections of the work and to furnish proper materials, labor, equipment and tools, and perform acceptable work, and to provide adequate safety precautions, in conformance with the intent of the Agreement.

5.17.2 Whenever Contractor varies the period during which work is carried on each day, it shall give due notice to Owner so that proper inspection may be provided. Any work not so inspected shall be subject to rejection. Proper facilities for safe access for inspection to all parts of the work shall at all times be maintained for the necessary use of Owner, and agents of the Federal, State, or local governments at all reasonable hours for inspection by such agencies to ascertain compliance with laws and regulations.

5.17.3 One or more inspectors may be assigned to observe the work and to act in matters of construction under this Agreement. Inspectors shall have the power to issue instructions and make decisions within the limits of Owner's authority. Such inspection shall not relieve Contractor of its obligation to conduct comprehensive inspections of the work, to furnish proper materials, labor, equipment and tools, and perform acceptable work, and to provide adequate safety precautions in conformance with the intent of the Agreement.

5.17.4 Owner and its representatives shall at all times have access to the work wherever it is in preparation or progress; and Contractor shall provide safe and convenient facilities for such access and for inspection. If the Specifications, Owner's instructions,

laws, ordinances, or any public authority require any material, equipment or work to be specifically tested or approved, Contractor shall give Owner timely notice of its readiness for inspection, and if the inspection is by an authority other than Owner, of the time fixed for inspection. Inspections by Owner will be made promptly and, where practicable, at the source of supply.

5.17.5 Work performed without inspection may be required to be removed and replaced under proper inspection and the entire cost of removal and replacing, including the cost of Owner-furnished materials used in the work, shall be borne by Contractor, regardless of whether or not the work is found to be defective. Examination of questioned work, other than that installed without inspection, may be ordered by Owner and, if so ordered, the work must be uncovered by Contractor. If such work is found to be in accordance with the Construction Provisions, Owner will pay the cost of examination and replacement. If such work is not in accordance with the Construction Provisions, Contractor shall pay such cost unless it can show that the defect in the work was caused by another contractor, and in that event Owner will pay such costs.

5.17.6 The inspection of the work shall not relieve Contractor of its obligation to complete the Project as herein prescribed, or in any way alter the standard of performance provided by Contractor; and defective work shall be made good and unusable materials may be rejected, notwithstanding that such work and materials have been previously overlooked by Owner and accepted or estimated for payment. If the work or any part thereof shall be found defective, Contractor shall, within ten (l0) calendar days, make good such defect in a manner satisfactory to Owner. If Contractor shall fail or neglect to make ordered repairs of defective work or to remove the condemned materials from the work within ten (l0) calendar days after direction by Owner in writing, Owner may make the ordered repairs, or remove the condemned materials, and deduct the cost thereof from any monies due to Contractor.

5.17.7 Contractor shall furnish promptly without additional charge all facilities, labor and materials reasonably needed by Owner for performing all inspection and tests. Contractor shall be charged with any additional cost of inspection when material and workmanship are not ready at the time specified by Contractor for its inspection.

5.17.8 Where any part of the work is being done under an encroachment permit or building permit, or is subject to Federal, State, County or City codes, laws, ordinances, rules or regulations, representatives of the government agency shall have full access to the work and shall be allowed to make any inspection or tests in accordance with such permits, codes, laws, ordinances, rules, or regulations. If advance notice of the readiness of the work for inspection by the governing agency is required, Contractor shall furnish such notice to the appropriate agency.

5.17.9 Owner may inspect the production of material, or the manufacture of products at the source of supply. Plant inspection, however, will not be undertaken until Owner is assured of the cooperation and assistance of both Contractor and the material producer.

Owner or its authorized representative shall have free entry at all times to such parts of the plant as concerns the manufacture or production of the materials. Adequate facilities shall be furnished free of charge to make the necessary inspection. Owner assumes no obligation to inspect materials at the source of supply.

5.18 TESTS

Contractor shall perform at its expense all tests specified or required by the Specifications. Owner will perform such tests as it deems necessary to determine the quality of work or compliance with Construction Provisions. Contractor shall furnish promptly without additional charge all facilities, labor, and material reasonably required for performing safe and convenient tests as may be required by Owner. All tests by Owner will be performed in such a manner as will not unnecessarily delay the work. Contractor shall not be required to reimburse Owner for tests performed by Owner. If samples of materials are submitted which fail to pass the specified tests, Contractor shall pay for all subsequent tests.

5.19 REMOVAL OF REJECTED AND UNAUTHORIZED WORK AND MATERIALS

5.19.1 All work or materials which have been rejected shall be remedied, or removed and replaced by Contractor in an acceptable manner and no compensation will be allowed it for such removal, replacement, or remedial work.

5.19.2 Any work done beyond the lines and grades shown on the Plans or established by Owner or any extra work done without written authority will be considered as unauthorized work and will not be paid for. Upon order of Owner, unauthorized work shall be remedied, removed, or replaced at Contractor's expense.

5.19.3 Upon failure of Contractor to comply with any order of Owner made under this Section, Owner may cause rejected or unauthorized work to be remedied, removed, or replaced, and may deduct the costs therefor from any monies due or to become due Contractor.

5.20 DEDUCTIONS FOR UNCORRECTED WORK

If Owner deems it inexpedient to correct work damaged or not done in accordance with the Construction Provisions, an equitable deduction from the contract price shall be made therefor and such sum may be withheld by Owner from Contractor's payment.

5.21 EQUIPMENT AND PLANTS

5.21.1 Only equipment and plants suitable to produce the quality of work and materials required will be permitted to operate on the project.

5.21.2 Plants will be designed and constructed in accordance with general practice for such equipment and shall be of sufficient capacity to insure the production of sufficient material to carry the work to completion within the time limit.

5.21.3 Contractor shall provide adequate and suitable equipment and plants to meet the above requirements, and when ordered by Owner, shall remove unsuitable equipment from the work and discontinue the operation of unsatisfactory plants.

5.21.4 Contractor shall identify each piece of its equipment, other than hand tools, by means of an identifying number plainly stenciled or stamped on the equipment at a conspicuous location, and shall furnish to Owner a list giving the description of each piece of equipment and its identifying number. **In** addition, the make, model number and empty gross weight of each unit of compacting equipment shall be plainly stamped or stenciled in a conspicuous place on the unit. The gross weight shall be either the manufacturer's rated weight or the scale weight.

5.21.5 If this Agreement is terminated for any reason whatsoever before completion, Contractor shall promptly remove all of its equipment and supplies from Owner's property if notified to do so by Owner. If Contractor fails to do so, Owner shall have the right to remove such equipment and supplies at the expense of Contractor.

5.22 CHARACTER OF WORKER

If any subcontractor, or person employed by Contractor or any subcontractor shall be incompetent or act in a disorderly or improper manner, it shall be removed from the project work immediately, and such person shall not again be employed on the work. Such discharge shall not be the basis for any claim for compensation or damages against Owner, or any of its officers, directors, employees or agents.

5.23 SEPARATE CONTRACTS

5.23.1 Owner reserves the right to let other contracts in connection with this work. Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate its work with the other contractor's work.

5.23.2 If any part of Contractor's work depends for proper execution or results upon the work of any other contractor, Contractor shall inspect and promptly report to Owner any defects in such work that render it unsuitable for such proper execution and results. Contractor's failure to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of Contractor's work, except as to defects that may develop in the other contractor's work after the execution of Contractor's work. To insure proper execution of its subsequent work, Contractor shall at once report to Owner any discrepancy between the executed work and the drawings.

5.24 MATERIALS

5.24.1 Unless otherwise specifically stated in the Specifications, Contractor shall furnish all materials necessary for the execution and completion of the work. Unless otherwise specified, all materials shall be new and shall be manufactured, handled, and installed in a workmanlike manner to insure completion of the work in accordance with the Construction Provisions. Contractor shall, upon request of Owner, furnish satisfactory evidence as to the kind and quality of materials.

5.24.2 Where materials are to be furnished by Owner, the type, size, quantity and location at which they are available will be stated in the Construction Provisions.

5.24.3 Manufacturers' and suppliers' warranties, guarantees, operating manuals, instruction sheets and parts listed that are furnished with materials incorporated in the work, shall be delivered to Owner before final acceptance of the Project.

5.25 STORAGE OF MATERIALS; STORAGE AREAS

5.25.1 Articles or materials to be used in the work shall be stored in such manner as to insure the preservation of their quality and fitness for the work, and to facilitate inspection.

5.25.2 Plant facilities shall be installed on Owner's property or easements as shown on the Plans. Owner shall be specifically exempted in any agreement from any liability incurred from use of private property for construction purposes. Contractor shall make arrangements and pay for off-site property used for storage, offices, work assembly areas, etc. Contractor is solely responsible for storage of materials. No equipment to be incorporated in the project may be stored in an area subject to flooding.

5.26 TRADE NAMES AND ALTERNATIVES

For convenience in designation in the Specifications and Plans, articles or materials to be used in the work may be designated under a trade name or the name of a manufacturer and its catalog information. The use of an alternative article or material that is of equal quality and of the required characteristics for the purpose intended may be used, subject to the following requirements:

5.26.1 The burden of proof as to the quality and suitability of alternatives shall rest with Contractor, who shall furnish all information required by Owner. Owner shall be the sole judge as to the quality and suitability of alternative articles or materials and its decision shall be final.

5.26.2 Whenever any material, process, or article is specified by grade, patent or proprietary name, or manufacturer's name, such designation, unless otherwise stated, is used for facilitating the description of the material, process or article and shall be deemed to be followed by the words "or equal." Contractor may offer any material, process or article which shall in every respect be substantially equal to or better than

that specified. Contractor has the burden of proof as to equality of any material, process, or article.

Contractor shall submit any request for substitution, together with any substantiating data, at least five (5) work days prior to bid. In the event Contractor furnished material, processes, or articles that are more expensive than those specified, the difference in cost so furnished shall be borne by Contractor. Requests for substitution of products, materials or processes other than those specified must be accompanied by evidence whether or not the proposed substitution: (1) is equal in quality and serviceability to the specified item; (2) will not entail changes in detail and construction of related work; (3) will be acceptable in consideration of the required design and artistic effect; (4) will not provide a cost disadvantage to Owner. Contractor shall promptly provide, upon request, any other information that may be required of it to assist Owner in determining whether the proposed substitution is acceptable. The final decision shall be that of Owner. Owner's approval shall be in writing, shall follow the procedure for change orders, and shall be required for the use of a proposed substitute material. Owner may condition its approval of the substitution upon delivery to Owner of an extended warranty or other assurances of adequate performance of the substitution.

5.27 CERTIFICATES OF COMPLIANCE

5.27.1 A Certificate of Compliance shall be furnished prior to the use of any materials for which the Specifications require that such a certificate be furnished. In addition, when so authorized in the Specifications, Owner may permit the use of certain materials or assemblies prior to sampling and testing if accompanied by a Certificate of Compliance. The Certificate shall be signed by the manufacturer of the material or the manufacturer of assembled materials and shall state that the materials involved comply in all respects with the requirements of the Agreement. A Certificate of Compliance shall be furnished with each lot of material delivered to the work and the lot so certified shall be clearly identified in the Certificate.

5.27.2 All materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve Contractor of responsibility for incorporating material in the work which conforms to the requirements of the Construction Provisions and any such material not conforming to such requirements will be subject to rejection whether in place or not.

5.27.3 Owner reserves the right to refuse to permit the use of material on the basis of a Certificate of Compliance.

5.27.4 The form of the Certificate of Compliance and its disposition shall be as directed by Owner.

5.28 ASSIGNMENT OF CONTRACT

Contractor shall not assign the contract or sublet it as a whole or in part without the prior written consent of Owner, nor shall Contractor assign any monies due, or to become due to it hereafter, without the prior written consent of Owner.

5.29 USE OF COMPLETED PORTIONS, RIGHT TO OPERATE UNSATISFACTORY EQUIPMENT OR FACILITIES

5.29.1 Owner may, at any time, and from time to time, during the performance of the work, enter the work site for the purpose of installing any necessary work by Owner labor or other contracts, and for any other purpose in connection with the installation of facilities. In doing so, Owner shall endeavor not to interfere with Contractor and Contractor shall not interfere with other work being done by or on behalf of Owner.

5.29.2 If, prior to completion and final acceptance of all the work, Owner takes possession of any structure or facility (whether completed or otherwise) comprising a portion of the work with the intent to retain possession thereof (as distinguished from temporary possession contemplating the return to Contractor), then, while Owner is in possession of the same, Contractor shall be relieved of liability for loss or damage to such structure other than that resulting from Contractor's fault or negligence. Such taking of possession by Owner shall not relieve Contractor from any provisions of this Agreement respecting such structure, other than to the extent specified in the preceding sentence, nor constitute a final acceptance of such structure or facility.

5.29.3 If, following installation of any equipment or facilities furnished by the Contractor, defects requiring correction by Contractor are found, Owner shall have the right to operate such unsatisfactory equipment or facilities and make reasonable use thereof until the equipment or facilities can be shut down for correction of defects without injury to Owner.

5.30 LANDS FOR WORK, RIGHT-OF-WAY CONSTRUCTION ROADS, TEMPORARY UTILITY SERVICES

5.30.1 Owner will provide the lands, easements, rights-of-way, and/or encroachment permits necessary or other rights to enter and work on lands necessary for the performance of the work. Other permits and licenses are addressed by section 5.11. Should Contractor find it advantageous to use any additional land for any purpose whatever, Contractor shall provide for the use of such land at its expense. Contractor shall provide Owner with a copy of written agreements or otherwise notify Owner in writing of additional working space which is acquired. Nothing herein contained and nothing marked on the Plans shall be interpreted as giving Contractor exclusive occupancy of the territory provided by Owner.

When two or more contracts are being executed at one time on the same or adjacent land in such a manner that work on one contract may interfere with that on

another, Owner shall decide which contractor shall cease work, and which shall continue, or whether the work on both contracts shall progress at the same time and in what manner; and the decision of Owner shall be final and binding. When the territory of one contract is the necessary or convenient means of access for the performance of another contract, such privilege of access or any other reasonable privilege may be granted by Owner to Contractor so desiring, to the extent, amount, in the manner, and at the time permitted. No such decision as to the method or time of conducting the work or the use of territory shall be the basis of any claim for delay or damage.

5.30.2 Lands, easements or rights-of-way to be furnished by Owner for construction operations will be specifically shown on the Plans.

5.30.3 Contractor shall construct and maintain all roads necessary to reach the various parts of the work and for the transportation thereto of construction material and personnel. The cost of constructing and maintaining such roads shall be borne by Contractor.

5.30.4 Contractor shall make its own arrangements for any utility services it may require during the life of this project. Where possible, Contractor may connect to Owner's existing water and electric power service. Contractor shall make its own arrangements for telephone service which it will require for its field office.

5.31 PROGRESS SCHEDULE

5.31.1 Within ten (10) days after the effective date of the Notice to Proceed, Contractor shall submit a schedule or schedules which shall show the dates at which Contractor will start and complete the work or the several parts of the work, as applicable. This schedule shall conform to the completion time specified in the Contract Agreement. Contractor shall review and, if necessary, revise the progress schedule at least once per month, and in any event shall submit a current schedule to Owner at its request at any time during the contract period.

5.31.2 Owner shall be advised in advance by Contractor when construction work is scheduled and the days when no construction work will take place. If Contractor fails to notify Owner in advance of the day or days when no construction work will be done, Contractor will be charged the cost of inspection for that day or days and such charges may be deducted from any payment due Contractor.

5.31.3 When, in the judgment of Owner, it is necessary to accelerate any part of the work ahead of schedule, Contractor shall, when directed, concentrate its efforts on such part of the work.

5.32 COMMENCEMENT AND PROGRESS OF THE WORK AND TIME OF COMPLETION/CONSTRUCTION SEQUENCE

5.32.1 Contractor shall commence the work covered by this Agreement within fifteen (15) days after date of issuance of Notice to Proceed from Owner to proceed with the

work. Work will be considered to have commenced when Contractor begins ordering materials and equipment or starts site work. Contractor shall not commence work or incur any expenses in connection therewith, before it is notified to proceed with the work. Work on the total project shall be completed within the calendar day duration stated in the agreement from the date of the Notice to Proceed. The time allowed for completion includes an allowance for working time lost due to normal inclement weather. A Pre-Construction conference will be scheduled by Owner prior to Contractor starting work.

5.32.2 Contractor shall give Owner written notice not less than two (2) working days in advance of the actual date on which the work will be started. Contractor shall be entirely responsible for any delay in the work that may be caused by this failure to give such notice. Owner shall have the right to specify the locations where Contractor shall start and proceed with the work.

5.32.3 Contractor shall diligently pursue the work and complete the work as specified within the time limits as set forth in the Construction Provisions.

5.33 SUSPENSION OF WORK

5.33.1 Owner may at any time, by notice in writing to Contractor, suspend any part of the work for such period of time as may be necessary to prevent improper execution of the work on the project by Contractor, its subcontractors or agents, and Contractor shall have no claim for damages or additional compensation on account of any such suspension.

5.33.2 Owner may at any time suspend any part or all of the work upon ten (10) days written notice to Contractor, who shall thereupon discontinue all work suspended except for all operations to prevent loss or damage to work already executed as may be directed by Owner. In the event a part of the work is suspended, Contractor, if the suspension is not through its fault or the fault of its subcontractors or agents, shall be paid in accordance with section 5.3.9 for costs of work performed in accordance with such orders of Owner during such suspension, provided that this shall not include any cost pertaining to work not suspended by the notice to suspend work. Work shall be resumed by Contractor after such suspension on subsequent written notice to resume work from Owner. In the event of suspension of the entire work by Owner, Contractor, if the suspension is not through the fault of Contractor or the fault of its subcontractors or agents, shall be paid the sum of $50 for each calendar day during which the entire work shall have been suspended. Said sum is hereby mutually agreed upon as fixed and liquidated damages in full settlement of all costs and expenses, losses and damages resulting to Contractor from such suspension.

5.33.3 In the event of any suspension of the work in whole or in part under subsection 5.33.2 above, if the suspension is not through the fault of Contractor or the fault of its subcontractors or agents, Contractor shall be entitled to an extension of time wherein to

complete the work to the extent of the delay caused Contractor thereby. If no agreement can be reached as to the time for extension, Contractor shall submit a claim to Owner within fifteen (15) days of a notice from Owner that no agreement can be reached. The claim shall be processed in accordance with section 5.4.

5.33.4 In the event the entire work shall be suspended by order of Owner, and shall remain so suspended for a period of sixty (60) consecutive days, through no fault of Contractor or its subcontractors or agents, and notice to resume the work shall not have been served on Contractor, Contractor may, at its option, by written notice to Owner, terminate the Agreement in the same manner and on the same terms as if the termination had been initiated by Owner pursuant to section 5.34.6, and Owner shall have no claim for damages because of such termination of the Agreement.

5.34 TERMINATION FOR DEFAULT - DAMAGES FOR DELAY - TIMELY EXTENSION - TERMINATION FOR CONVENIENCE

5.34.1 Termination for Default. Contractor shall at all times employ such force, plant, materials, supplies, equipment and tools as will be sufficient, in the opinion of Owner, to prosecute the work at not less than the rates fixed under the terms of the Agreement and to complete the work or any part thereof within the time limits fixed by the Agreement. If Contractor refuses or fails to prosecute the work, or any separable part thereof, with such diligence as will ensure the completion within the time specified in the Agreement, or any extension thereof, or fails to complete said work within such time, Owner may, after giving ten (10) days written notice to Contractor, terminate its right to proceed with the work or such part of the work as to which there has been delay.

5.34.2 Contractor's right to proceed shall not be so terminated nor Contractor charged with resulting damage if:

5.34.2.1 The delay in the completion of the work arises from unforeseeable causes beyond the control and without the fault or negligence of Contractor, including but not restricted to Acts of God, acts of the public enemy, acts of Owner, acts of another contractor in the performance of a contract with Owner, fires, floods (excluding site flooding due to groundwater), epidemics, quarantine restrictions, strikes, lockouts, freight embargoes, unusually severe weather, or delays of subcontractors and suppliers arising from unforeseeable causes beyond the control and without the fault or negligence of either Contractor or such subcontractors and suppliers; and

5.34.2.2 Contractor, within ten (10) days from the beginning of any such delay (unless Owner grants a further period of time before the date of final payment under the Agreement), notifies Owner in writing of the causes of delay and requests an extension of time. Owner shall ascertain the facts and the extent of the delay and extend the time for completing the work when, in its judgment, the findings of fact justify such an extension. If Contractor disagrees with Owner's decision, it shall submit a claim to

Owner within fifteen (15) days after Owner's decision, which claim shall be processed in accordance with section 5.4.

5.34.3 A request for an extension of time, or the granting of an extension of time, shall not constitute a basis for any claim against Owner for additional compensation or damages unless caused by Owner or another contractor employed by Owner.

5.34.4 If Contractor should be adjudged bankrupt, or if it should make a general assignment for the benefit of its creditors, or if a receiver should be appointed for Contractor on account of its insolvency and not be discharged within ten (10) days after its appointment, or if Contractor should fail to make prompt payments to subcontractors or suppliers, or should it persistently disregard laws, ordinances, or the instructions of Owner, or should it improperly execute the work, or should it otherwise commit a substantial violation of any provisions of the Agreement, Owner may, after giving ten (10) days written notice to Contractor, terminate the Agreement and/or Contractor's right to proceed with the work.

5.34.5 The rights and remedies of Owner provided in this section are in addition to any of the rights and remedies provided by law or under this Agreement.

5.34.6 Termination for Convenience. In addition to Owner's rights under this section, if at any time before completion of the work under the Agreement, Owner determines that it is advisable for it to terminate the work, for whatever reason, it may do so upon ten (10) days written notice to Contractor. Upon service of such notice of termination, Contractor shall discontinue the work in such manner, sequence, and at such times as Owner may direct. Contractor shall have no claim for damages for such discontinuance or termination, nor any claim for anticipated profits on the work thus dispensed with or uncompleted, nor any other claim except for the work actually performed up to the time of termination, including any extra work ordered by Owner to be done, nor for any claim for liquidated damages in accordance with the provisions of section 5.33.

a. Owner shall issue Contractor a written notice specifying that the Contract is to be terminated. Upon receipt of said notice and, except as otherwise directed in writing by Owner, Contractor shall:

(1) Stop all work under the Contract except that specifically directed by Owner to be completed;

(2) Perform any work Owner deems necessary to secure the project for termination;

(3) Remove equipment from the site;

(4) Take such action as is necessary to protect materials from damage;

(5) Notify all subcontractors and suppliers that the Contract is terminated and that no further work is to be performed unless authorized in writing by Owner.

(6) Provide Owner with a list of all material previously produced, purchased or ordered from suppliers but not yet used in the work, its storage location, and any

other information requested by Owner. It shall be Contractor's responsibility to provide Owner with good title to all materials purchased by Owner hereunder;

(7) Dispose of material not yet used in the work as directed by Owner;

(8) Subject to the prior written approval of Owner, settle all outstanding liabilities and all claims arising out of subcontracts or orders for material terminated hereunder;

(9) Furnish Owner with all documentation required under the Contract;

(10) Take such other actions as Owner may direct.

b. Termination of the Contract pursuant to this section shall not relieve the Contractor of responsibility for damage to materials except as follows:

(1) Contractor's responsibility for damage to materials for which payment has been made and for materials furnished for use in the work and unused shall terminate when Owner certifies that such materials have been stored in the manner and at the locations it has directed;

(2) Contractor's responsibility for damage to materials purchased by Owner subsequent to the issuance of the notice of termination shall terminate when title and delivery of such materials has been taken by Owner.

(3) When Owner has determined that Contractor has completed all work under the Contract directed to be completed prior to termination and such other Work as may have been ordered to secure the project for termination, Owner may formally accept the Project, and immediately upon and after such Acceptance, Contractor shall not be required to perform any further work and shall be relieved of its contractual responsibilities.

(c) The provisions of this Section shall be included in all subcontracts.

5.35 RIGHTS OF OWNER UPON TERMINATION

5.35.1 In the event the right of Contractor to proceed with the work, or any portion thereof, has been terminated because of the fault of Contractor and Contractor has been given ten (10) days notice to cure such fault and has not done so, Owner may take over the work and prosecute the same to completion by contract or any other method Owner deems expedient, and may take possession of and utilize in completing the work such materials, appliances, equipment and plant as may be on the site of the work and necessary therefor. Whether or not Contractor's right to proceed with the work is terminated, it and its sureties shall be liable for all damages, including but not limited to, costs of managerial and administrative services, engineering, legal and other consultant fees, sustained or incurred by Owner in enforcing the provisions of section 5.34 and in completing or causing to complete the Project.

5.35.2 Upon termination, Contractor shall not be entitled to receive any further payment until the work is finished. If upon completion of the work the total cost to

Owner, including, but not limited to, engineering, legal and other consultant fees, costs of managerial and administrative services, construction costs and liquidated damages, shall be less than the amount which would have been paid if the work had been completed by Contractor in accordance with the terms of the Agreement, then the difference shall be paid to Contractor in the same manner as the final payment under the Agreement. If the total cost incurred by Owner on account of termination of Contractor and subsequent completion of the work by Owner by whatever method Owner may deem expedient shall exceed said amount which Contractor would otherwise have been paid, Contractor and its sureties shall be liable to Owner for the full amount of such excess expense.

5.35.3 The rights and remedies of Owner provided in this section are in addition to any of the rights and remedies provided by law or under this Agreement.

5.36 FAILURE TO COMPLETE THE WORK IN THE TIME AGREED UPON LIQUIDATED DAMAGES

5.36.1 It is agreed by the parties to the Agreement that time is of the essence; and that in case all the work is not completed before or upon the expiration of the time limit as set in the Contract Agreement, or within any time extensions that may have been granted, damage will be sustained by Owner; and that it may be impracticable to determine the actual amount of damage by reason of such delay; and it is, therefore, agreed that Contractor shall pay to Owner as damages the amount of $500 per day for each and every day's delay in finishing the work in excess of the number of days specified. The parties expressly agree that this liquidated damage clause is reasonable under the circumstances existing at the time the Agreement was made. Owner shall have the right to deduct the amount of liquidated damages from any money due or to become due Contractor.

5.36.2 In addition, Owner shall have the right to charge Contractor and to deduct from the final or progress payments for the work the actual cost to Owner of legal, engineering, inspection, superintendence and other expenses that are directly chargeable to the Project and that accrue during the period of such delay, except that the cost of final inspection and preparation of the final estimate shall not be included in the charges.

5.36.3 Notwithstanding the provisions of section 5.36.1, Contractor shall not be liable for liquidated damages or delays caused by the removal or relocation of utilities when such removal or relocation is the responsibility of Owner or Owner of the utility under California Government Code § 4215.

5.37 CLEAN-UP

5.37.1 During the progress of the work, Contractor shall maintain the site and related structures and equipment in a clean, orderly condition and free from unsightly accumulation of rubbish. Upon completion of work and before the final estimate is

submitted, Contractor shall at its own cost and expense remove from the vicinity of the work all plants, buildings, rubbish, unused work materials, concrete forms, and temporary bridging and other like materials, belonging to it or used under its direction during the construction; and in the event of its failure to do so, the same may be removed by Owner after ten (10) calendar days notice to Contractor, such removal to be at the expense of Contractor. Where the construction has crossed yards or driveways, they shall be restored by Contractor to the complete satisfaction of Owner, at Contractor's expense.

5.37.2 Contractor shall dispose of all testing or disinfection water without damage to property, and all in accordance with applicable regulations. All chlorinated water shall be dechlorinated prior to discharge.

5.38 COMPLIANCE WITH LAWS; PERMITS; TAXES

Contractor is an independent contractor and shall at its sole cost and expense do the following: comply with all laws, rules, ordinances and regulations of all federal, state and local agencies having jurisdiction over the work. Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the lawful prosecution of the work (exclusive of any building permits or permits for utility easements or licenses, which permits shall be obtained and fees paid by Owner); pay all federal, state and local taxes, including manufacturers' taxes, sales taxes, use taxes, processing taxes, and payroll, wage, insurance, social security, and unemployment taxes on wages, salaries or any remuneration paid to Contractor's employees, whether levied under existing or subsequently enacted laws, rules or regulations; and pay all property tax assessments on materials or equipment used until acceptance by Owner. If any discrepancy or inconsistency is discovered in the Plans or Specifications, or in this Agreement in relation to any such law, rule, ordinance, regulation, order or decree, Contractor shall forthwith report the same to Owner in writing. Contractor shall also protect, defend, hold harmless and indemnify Owner and all of Owner's officers, directors, agents, and employees against any claim or liability arising from or based upon the violation of any such law, rule, ordinance, regulation, order or decree, whether by Contractor itself or by its employees. Particular attention is called to the following:

5.38.1 Without limitation, materials furnished and performance by Contractor hereunder shall comply with Safety Orders of the Division of Industrial Safety, State of California, Federal Safety regulations of the Bureau of Labor, Department of Labor; and any other applicable Federal regulations.

5.38.2 Contractor, upon request, shall furnish evidence satisfactory to Owner that any or all of the foregoing obligations have been or are being fulfilled. Contractor warrants to Owner that it is licensed by all applicable federal, state and local governmental bodies to perform this Agreement and will remain so licensed throughout the progress of the work, and that it has, and will have, throughout the progress of the work, the

necessary experience, skill and financial resources to enable it to perform this Agreement.

5.39 PREVAILING WAGE, AND TRAVEL AND SUBSISTENCE PAY

5.39.1 Contractor shall forfeit as penalty to Owner not more than the sum of fifty dollars ($50) for each calendar day or portion thereof for each worker (whether employed by Contractor or subcontractor) paid less than the stipulated prevailing rates for any work done under the Agreement in violation of the provisions of the California Labor Code and in particular, §§ 1772 to 1780. The amount of this penalty shall be determined by the Labor Commissioner and shall be based on consideration of Contractor's mistake, inadvertence, or neglect in failing to pay the correct rate of prevailing wages, or the previous record of Contractor in meeting its prevailing wage obligations, or a contractor's willful failure to pay the correct rates of prevailing wages. A mistake, inadvertence, or neglect in failing to pay the correct rate of prevailing wages is not excusable if Contractor had knowledge of its obligations under Labor Code §§ 1720, *et seq*. In addition to the aforementioned penalty, each worker shall be paid the difference between the prevailing wage rate and the amount paid to each worker for each calendar day or portion thereof or which said worker was paid less than the prevailing wage.

5.39.2 Owner will not recognize any claims for additional compensation because of the payment of the wages set forth in the Construction Provisions. The possibility of wage increases is one of the elements to be considered by Contractor in determining its Bid, and will not under any circumstances be considered as the basis of a claim against Owner.

5.40 LABOR DISCRIMINATION

Attention is directed to California Labor Code § 1735 which is applicable to the work under this Agreement and which reads as follows: "A contractor shall not discriminate in the employment of persons upon public works on any basis listed in subdivision (a) of § 12940 of the Government Code, as those bases are defined in §§ 12926 and 12926.1 of the Government Code, except as otherwise provided in § 12940 of the Government Code. Every contractor for public works who violates this section is subject to all the penalties imposed for a violation of this chapter."

5.41 EIGHT-HOUR DAY LIMITATION

5.41.1 In accordance with the provisions of the California Labor Code, and in particular, §§ 1810 to 1815, eight hours labor shall constitute a day's work, and no worker, in the employ of Contractor, or any subcontractor, doing or contracting to do any part of the work contemplated by this Agreement, shall be required or permitted to work more than eight (8) hours in anyone calendar day and forty (40) hours in anyone calendar week in violation of those provisions; provided that subject to Labor Code §

1815, a worker may perform work in excess of either eight (8) hours per day or forty (40) hours during anyone week upon compensation for all hours worked in excess of eight (8) hours per day or forty (40) hours during anyone week at not less than one and one-halftimes the basic rate of pay. Except as just provided, Contractor shall forfeit as a penalty to Owner the sum of twenty-five dollars ($25) for each worker employed in the performance of this Agreement by it or by any subcontractor under it for each calendar day during which such worker is required or permitted to labor more than eight (8) hours in anyone calendar day and forty (40) hours in anyone calendar week in violation of §§ 1810 through 1815.

5.41.2 Contractor shall comply in all respects with the provisions of Labor Code § 1776, whose provisions are incorporated herein by this reference. In accordance with § 1776, Contractor and each subcontractor shall keep an accurate record showing the names, addresses, social security numbers, work classifications, and straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by it in connection with the work specified therein, which record shall be open at all reasonable hours to the inspection of County, State and Federal officers and agents at the Contractor's principal office. Certified copies of the payroll records shall be furnished or made available for inspection to others as provided in § 1776. These payroll records shall be certified and shall be on forms provided by the State Division of Labor Standards Enforcement, or shall contain the same information as the forms provided by the Division. Contractor shall file a certified copy of the payroll records with the entity that requested the records within ten (10) days after receipt of a written request. Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by Owner, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement shall be marked or obliterated in a manner so as to prevent disclosure of an individual's name, address, and social security number. The name and address of Contractor shall not be marked or obliterated.

Contractor shall inform Owner of the location of the payroll records, including the street address, city and county, and shall, within five (5) working days, provide a notice of a change of location and address. Contractor shall have ten (10) days in which to comply subsequent to receipt of written notice specifying in what respects Contractor must comply with this section. In the event that Contractor fails to comply with the 10-day period, he or she shall, as a penalty to Owner, forfeit twenty-five dollars ($25) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.

5.42 EMPLOYMENT OF APPRENTICES

Contractor's attention is directed to California Labor Code §§ 1777.5, 1777.6 and 1777.7 pertaining to employment of indentured apprentices, which are hereby incorporated by reference into this Agreement. As applicable, Contractor or any subcontractor employed by it in the performance of the Work shall take such actions as necessary to comply with the provisions of §§ 1777.5, 1777.6 and 1777.7.

5.43 WATER POLLUTION

Contractor shall exercise every reasonable precaution to protect streams, lakes, reservoirs, and canals from pollution with fuels, oils, bitumens, calcium chloride, and other harmful materials and shall conduct and schedule its operations so as to avoid or minimize muddying and silting of said streams, lakes, reservoirs, and canals. Care shall be exercised to preserve vegetation beyond the limits of construction. Contractor shall comply with California Fish and Game Code § 5650 and all other applicable statutes and regulations relating to the prevention and abatement of water pollution.

5.44 PATENTS

Contractor shall assume all costs arising from the use of patented materials, equipment, devices, or processes used on or incorporated into the work, and agrees to indemnify, defend, protect and save harmless Owner and all of its officers, directors, employees, and other representatives, from all suits at law, or actions of every nature for, or on account of, the use of any patented materials, equipment, devices, or processes.

5.45 PUBLIC CONVENIENCE

5.45.1 This section defines Contractor's responsibility with regard to convenience of the public and public traffic in connection with its operations.

5.45.2 Contractor shall conduct its operations as to offer the least possible obstruction and inconvenience to the public; and it shall have under construction no greater length or amount of work than it can prosecute properly with due regard to the rights of the public.

5.45.3 Unless otherwise provided in the Construction Provisions, all public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible.

5.45.4 Spillage resulting from hauling operations along or across any publicly traveled way shall be removed immediately by Contractor at its expense.

5.45.5 Construction operations shall be conducted in such a manner as to cause as little inconvenience as possible to abutting property owners.

5.45.6 Convenient access to driveways, houses and buildings along the line of the work shall be maintained and temporary approaches to crossings or intersecting highways shall be provided and kept in good condition. When the abutting property owner's access across the right-of-way line is to be eliminated, or to be replaced under the Agreement by other access facilities, the existing access shall not be closed until the replacement access facilities are usable.

5.45.7 Water shall be supplied at Contractor's expense if ordered by Owner for the alleviation or prevention of dust nuisance as provided in the Construction Provisions.

5.45.8 In order to expedite the passage of public traffic through or around the work, Contractor shall install signs, lights, flares, barricades, and other facilities for the sole convenience and direction of public traffic. Also, Contractor shall provide and station competent flaggers whose sole duties shall consist of directing the movement of public traffic through or around the work. The cost of furnishing and installing such signs, lights, flares, barricades, and other facilities, and the cost of providing and stationing such flaggers, all for the convenience and direction of public traffic, will be considered as included in the Agreement price and no additional compensation will be allowed.

5.45.9 Flaggers and guards, while assigned to traffic control, shall perform their duties and shall be provided with the necessary equipment in accordance with the current "Instructions to Flaggers" of the California Department of Transportation . The equipment shall be furnished and kept clean and in good repair by Contractor at its expense.

5.46 UNDERGROUND UTILITIES

Prior to conducting any excavation, Contractor shall contact the appropriate regional notification center as required by and shall otherwise comply with California Government Code § 4216, et seq. In accordance with Government Code § 4215, Contractor shall be compensated for the costs of locating, repairing damage not due to the failure of Contractor to exercise reasonable care, and removing or relocating existing main or trunkline utility facilities not indicated in the Project Plans and Specifications with reasonable accuracy, and for the equipment on the project necessarily idled during such work; provided that Contractor shall first notify Owner before commencing work on locating, repairing damage to, removing or relocating such utilities.

5.47 SAFETY AND TRENCHING

5.47.1 Contractor shall be solely and completely responsible for the conditions of the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours. Safety provisions shall conform to all applicable Federal, State, and local laws, ordinances, and codes, and to the rules and regulations established by the California Division of Industrial Safety, and to other rules of law applicable to the work. Pursuant to Labor Code § 6500 *et seq.*, Contractor must obtain a permit prior to the construction of

trenches or excavations that are five feet or deeper and into which a person is required to descend.

5.47.2 The services of Owner in conducting construction review of the Contractor's performance is not intended to include review of the adequacy of Contractor's work methods, equipment, bracing or scaffolding or safety measures, in, on, or near the construction site, and shall not be construed as supervision of the actual construction nor make Owner responsible for providing a safe place for the performance of work by Contractor, subcontractors, or suppliers; or for access, visits, use work, travel or occupancy by any person.

5.47.3 Contractor shall carefully instruct all personnel working in potentially hazardous work areas as to potential dangers and shall provide such necessary safety equipment and instruction as is necessary to prevent injury to personnel and damage to property. Special care shall be exercised relative to electrical work, work involving excavation and in pump sump work.

5.47.4 All work and materials shall be in strict accordance with all applicable State, Federal and local laws, rules, regulations, and codes.

5.47.5 Nothing in this Agreement is to be construed to permit work not conforming to governing law. When Construction Provisions differ from governing law, Contractor shall furnish and install the higher standards called for without extra charge. All equipment furnished shall be grounded and provided with guards and protection as required by safety codes. When vapor-tight or explosion-proof electrical installation is required by law, this shall be provided.

5.47.6 Shoring and Trench Safety Plan. Attention is directed to California Civil Code § 832 relating to lateral and subjacent support, and Contractor shall comply with this law.

5.47.7 In accordance with California Labor Code § 6705, if the total amount of the project is in excess of $25,000, Contractor shall submit to Owner for acceptance, 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 5 feet of more in depth.

5.47.7.1 The plan shall be prepared by a registered civil or structural engineer. As a part of the plan, a note shall be included stating that the registered civil or structural engineer certifies that the plan complies with applicable requirements of the United States Department of Labor regulations (29 CFR Part 1926) and the Cal-OSHA Construction Safety Orders, whichever are more stringent, or that the registered civil or structural engineer certifies that the plan is not less effective than the shoring, bracing, sloping, or other provisions of OSHA and the Safety Orders.

5.47.7.2 Owner or its consultants may have made investigations of subsurface conditions in areas where the work is to be performed. If so, these investigations are identified in the Construction Provisions and the records of such investigations are

available for inspection at the Owner's office. The detailed plan showing the design of shoring, etc., which Contractor is required to submit to Owner for acceptance of excavation will be not accepted by Owner if the plan is based on subsurface conditions which are more favorable than those revealed by the investigations made by Owner or its consultants; nor will the plan be accepted if it is based on soils-related criteria which is less restrictive than the criteria set forth in the report on the aforesaid investigations of subsurface conditions.

5.47.7.3 The detailed plan showing the design of shoring, etc., shall include surcharge loads for nearby embankments and structures, for spoil banks, and for construction equipment and other construction loadings. The plan shall indicate for all trench conditions the minimum horizontal distances from the side of the trench at its top to the near side of the surcharge loads.

5.47.7.4 Nothing contained in this section shall be construed as relieving Contractor of the full responsibility for providing shoring, bracing, sloping, or other provisions which are adequate for worker protection. Review of the plan by Owner is only for general conformance to OSHA and the Safety Orders. Their failure to note exceptions to the submittal does not relieve Contractor of any responsibility or liability for the plan. Contractor remains solely and completely responsible for all trench safety and for the means, methods, procedures, and materials therefor.

5.47.7.5 In accordance with California Public Contract Code § 7104, in the event that the work involves digging trenches or other excavations that extend deeper than four (4) feet below the surface, Contractor shall promptly, and before the following conditions are disturbed, notify Owner in writing, of any:

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

(b) Subsurface or latent physical conditions at the site differing from those indicated by information about the site made available to bidders prior to the deadline for submitting bids; or,

(c) Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Agreement. Owner shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in 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 Agreement. In the event that a dispute arises between Owner and Contractor when the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in Contractor's cost of, or time required for, performance of

any part of the work, Contractor shall not be excused from any scheduled completion date provided for by the Agreement, but shall proceed with all work to be performed under the Agreement. Contractor shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

5.48 PROTECTION OF PERSON AND PROPERTY

5.48.1 Contractor shall take whatever precautions are necessary to prevent damage to all existing improvements, including above ground and underground utilities, trees, shrubbery that is not specifically shown to be removed, fences, signs, mailboxes, survey markers and monuments, buildings, structures, Owner's property, adjacent property, and any other improvements or facilities within or adjacent to the work. If such improvements or property are injured or damaged by reason of Contractor's operations, they shall be replaced or restored, at Contractor's expense, to a condition at least as good as the condition they were in prior to the start of Contractor's operations.

5.48.2 Contractor shall adopt all practical means to minimize interference to traffic and public inconvenience, discomfort or damage. Contractor shall protect against injury to any pipes, conduits or other structures crossing the trenching or encountered in the work and shall be responsible for any injury done to such pipes or structures, or damage to property resulting therefrom. Contractor shall support or replace any such structures without delay and without any additional compensation to the entire satisfaction of Owner. All obstructions to traffic shall be guarded by barriers illuminated at night. Contractor shall be responsible for all damage to persons and property directly or indirectly caused by its operations and, under all circumstances, it must comply with the laws and regulations of Owner and the State of California relative to safety of persons and property and the interruption of traffic and the convenience of the public within the respective jurisdictions.

5.48.3 Contractor is cautioned that it must replace all improvements in rights-of-way and within the public streets to a condition equal to what existed prior to its entry onto the job.

5.48.4 Type and time of construction required at any road subject to interference by Project work will be determined by those authorities responsible for maintenance of said road. It shall be the responsibility of Contractor to determine the nature and extent of all such requirements, including provision of temporary detours as required; however, any construction right-of-way obtained by Owner at affected roadways will be adequate for provision of all required detours. As required at any road crossing, Contractor shall provide all necessary flaggers, guardrails, barricades, signals, warning signs and lighting to provide for the safety of existing roads and detours. Immediately after the need for temporary detours ceases, or when directed, Contractor shall remove such detours and perform all necessary cleanup work, including replacement of fences, and removal of pavement. Included shall be all necessary replacement of existing

roadway appurtenances, grading work, soil stabilization and dust control measures, as required and directed. The cost of all work specified under this section shall be borne by Contractor.

5.48.5 Contractor shall examine all bridges, culverts, and other structures over which it will move its materials and equipment, and before using them, it shall properly strengthen such structures where necessary. Contractor shall be responsible for any and all injury or damage to such structures caused by reason of its operations.

5.49 RESPONSIBILITY FOR REPAIR OF FACILITIES

All public or private facilities, including but not limited to canals, structures, telephone cables, roadways, curbs, gutters, parking lots, private drives, levees and embankments for creeks, ponds and reservoirs disturbed during construction of the work shall be repaired and/or replaced by Contractor to match facilities existing prior to construction.

5.50 OWNER'S REPAIR

In the event Contractor refuses or neglects to make good any loss or damage for which it is responsible under this Agreement, Owner may itself, or by the employment of others, make good any such loss or damage, and the cost and expense of doing so, including any reasonable engineering, legal and other consultant fees, and any costs of administrative and managerial services, shall be charged to Contractor. Such costs and expenses may be deducted by Owner from claims for payment made by Contractor for work completed or remaining to be completed.

5.51 CONTRACTOR'S LICENSE NOTICE

STATEMENT REQUIRED BY CALIFORNIA BUSINESS & PROFESSIONS CODE § 7030:

"CONTRACTORS ARE REQUIRED BY LAW TO BE LICENSED AND REGULATED BY 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 YEARS OF THE DATE OF THE ALLEGED VIOLATION. A COMPLAINT REGARDING A LATENT ACT OR OMISSION PERTAINING TO STRUCTURAL DEFECTS MUST BE FILED WITHIN 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."

5.52 INSURANCE

[NOTE: THE FOLLOWING PROVISIONS SHALL APPLY UNLESS OWNER OR ITS INSURANCE CARRIER REQUIRES OTHER PROVISIONS PRIOR TO ISSUANCE OF THE NOTICE TO BIDDERS FOR THIS PROJECT.]

5.52.1 Contractor shall procure and maintain for the duration of the Work the following insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by Contractor, its agents, representatives, employees or subcontractors.

5.52.2 Minimum Scope of Insurance. Coverage shall be at least as broad as:

a. Commercial general liability coverage (Insurance Services Office occurrence form CO 0001), including liability coverage for premises and operations, explosion and collapse hazard, underground hazard, products/completed operations hazard, contractual liability, use of independent contractors, and broad form property damage with completed operations.

b. Automobile liability coverage (Insurance Services Office form CA 0001, code I, any auto).

c. Workers' compensation insurance as required by the State of California and employer's liability insurance.

d. Professional Liability coverage (structural design engineer for welded steel tank and foundation).

5.52.3 Minimum Limits of Insurance. Contractor shall maintain limits no less than:

a. General Liability: $5,000,000 per occurrence for bodily injury, personal injury and property damage. If commercial general liability insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.

b. Automobile Liability: $1,000,000 per accident for bodily injury and property damage.

c. Employer's Liability: $1,000,000 per accident for bodily injury or disease.

d. Professional Liability: $2,000,000

The above insurance limits can be met through provision of umbrella or excess policy insurance coverage consistent with the provisions of this Section 5.52.

5.52.4 Deductibles and Self-Insured Retentions. Any deductibles or self-insured retentions must be declared to and approved by Owner. At the option of Owner, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects Owner, its officers, officials, employees and volunteers; or Contractor shall

procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses.

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

5.52.5.1 Owner and its officers, officials, employees, agents and volunteers are to be covered as additional insureds as respects: liability arising out of activities performed by or on behalf of Contractor, products and completed operations of Contractor; premises owned, occupied or used by Contractor; or automobiles owned, leased, hired or borrowed by Contractor. The coverage shall contain no special limitations on the scope of protection afforded to Owner and its officers, officials, employees, agents or volunteers. The additional insured coverage or endorsement shall comply with California Insurance Code § 11580.04.

5.52.5.2 For any claims related to this project, Contractor's insurance coverage shall be primary insurance as respects Owner and its officers, officials, employees, agents and volunteers. Any insurance or self-insurance maintained by Owner, and its officers, officials, employees, agents or volunteers shall be excess of Contractor's insurance and shall not contribute with it.

5.52.5.3 Any failure to comply with reporting or other provisions of the policies including breaches of warranties shall not affect coverage provided to Owner and its officers, officials, employees, agents or volunteers.

5.52.5.4 Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

5.52.5.5 Contractor agrees that insurance coverage shall not be suspended, voided, canceled by either party, or reduced in coverage or in limits except after thirty (30) days' prior written notice by U.S. mail has been given to Owner. Contractor shall provide to Owner its insurance certificate with a cancellation provision stating that Owner shall be notified of any change in the policy at least thirty (30) days before any such change is made.

5.52.6 Course of construction policies shall contain, or be endorsed to contain, the following provisions: (a) Owner shall be named as loss payee; and (b) The insurer shall waive all rights of subrogation against Owner.

5.52.7 Acceptability of Insurers. Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A-:VII or equivalent, unless otherwise approved by Owner.

5.52.8 Verification of Coverage. Prior to commencing work, Contractor shall provide to Owner the following proof of insurance: (a) certificate(s) of insurance on ACORD Form 25-S (or insurer's equivalent) evidencing the required insurance coverages; and (b) endorsement(s) on ISO Form CG 2010 (or insurer's equivalent), signed by a person

authorized to bind coverage on behalf of the insurer(s) and certifying the additional insured coverages, or equivalent additional insured blanket endorsement. Owner reserves the right to require complete copies of all required insurance policies and/or endorsements affecting required insurance coverage at any time.

5.52.9 Subcontractors. Contractor shall include all actions and activities of its subcontractors as insureds under its policies, or shall require each subcontractor to provide insurance coverage consistent with the provisions herein, except that each subcontractor will be required to maintain minimum general liability coverage of $1,000,000 per occurrence for bodily injury, personal injury and property damage, and to furnish separate endorsements or certificates to Owner. All coverages for subcontractors shall be subject to all of the other requirements stated in this section.

5.52.10 Any products/completed operations insurance coverage shall be maintained after completion of the project for the full guarantee period.

5.52.11 The requirements as to the types, limits, and Owner's approval of insurance coverage to be maintained by Contractor are not intended to and shall not in any manner limit or qualify the liabilities and obligations assumed by Contractor under the Agreement.

5.52.12 In addition to any other remedy Owner may have, if Contractor or any of the subcontractors fails to maintain the insurance coverage as required in this section 5.52, Owner may obtain such insurance coverage as is not being maintained, in form and amount substantially the same as required herein, and Owner may deduct the cost of such insurance from any amounts due or which may become due Contractor under this Agreement.

5.53 INDEMNITY AND LITIGATION COST

5.53.1 To the fullest extent allowed by law, Contractor shall protect, defend, indemnify and hold harmless Owner, its officers, directors, agents, employees, volunteers, and consultants from and against all penalties and fines imposed by law and all loss, claim, cause of action, demand, suit, judgment, cost, damage, expense, and liability (including but not limited to court or arbitration costs and reasonable attorneys' and expert witness fees) resulting from injury to or death of any persons, including without limitation employees of Owner and Contractor, or damage to or loss of property, caused by, arising out of or in any way connected with Contractor's or its subcontractors' or suppliers' performance, operations or activities under this Agreement, except to the extent the sole negligence, active negligence or willful misconduct of an indemnified party proximately causes the loss, claim, cost, suit, judgment, penalty, or liability. Upon the request of an indemnified party hereunder, Contractor shall defend any suit asserting a claim covered by this indemnity and shall pay any cost that may be incurred by an indemnified party in enforcing this indemnity. In all cases, the indemnified party shall have the right to approve counsel selected by

Contractor in the defense of any legal action or with respect to any claim, which approval shall not be unreasonably withheld. In addition, the indemnified party shall have the right to participate in and be represented by counsel of its own choice and at its own expense in any legal action or with respect to any claim. These duties of Contractor to indemnify and save the Owner harmless include the duties to defend set forth in California Civil Code Section 2778.

5.53.2 Owner may withhold from payment due Contractor hereunder such amounts as, in Owner's opinion, are sufficient to provide security against all loss, damage, expense, penalty, fine, cost, claim, demand, suit, cause of action, judgment, or liability covered by the foregoing indemnity provision.

5.53.3 In any and all claims against Owner, its consultants, officers, directors, employees and agents by any employee of Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation under this section shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable under Worker's Compensation statutes, disability benefit statutes or other employee benefit statutes.

5.53.4 Neither termination of this Agreement nor completion of the acts to be performed under this Agreement shall release Contractor from its obligations to indemnify, so long as the event upon which the claim is predicated shall have occurred prior to the effective date of any such termination or completion and arose out of or was in any way connected with performance or operations under this Agreement by Contractor, its employees, agents, suppliers or subcontractors, or the employee, agent or subcontractor of anyone of them.

5.53.5 Submission of insurance certificates or submission of other proof of compliance with the insurance requirements in this Agreement does not relieve Contractor from liability under this indemnification and hold harmless clause. The obligations of this indemnity section shall apply whether or not such insurance policies shall have been determined to be applicable to any of such damages or claims for damages.

5.53.6 In accordance with California Public Contract Code § 920I(b), if Owner receives any written third-party claim relating to work performed under this Agreement, then Owner agrees to promptly notify Contractor about the third-party claim.

5.54 PROTECTION OF WORK

5.54.1 Contractor shall be responsible for the care of all work until its completion and final acceptance; and it shall, at its own expense, replace damaged or lost material and repair damaged parts of the work or the same may be done at its expense by Owner and Contractor and its sureties shall be liable therefor. Contractor shall make its own provisions for properly storing and protecting all material and equipment against theft,

injury, or damage from any and all causes. Damaged material and equipment shall not be used in the work. Contractor shall take all risks from floods and casualties except as provided by law, and shall make no charge for the restoration of such portions of the work as may be destroyed or damaged by flood or other casualties or because of danger from flood or other casualties or for delays from such causes. Contractor may, however, be allowed a reasonable extension of time on account of such delays, subject to the conditions hereinbefore specified.

5.54.2 Contractor shall effectively secure and protect adjacent property and structures, livestock, crops and other vegetation. If applicable, Contractor shall open fences on or crossing the right-of-way and install temporary gates of sound construction thereon so as to prevent the escape of livestock. Adjacent fence posts shall be adequately braced to prevent the sagging or slackening of the wire. Before such fences are opened, Contractor shall notify Owner or tenant of the property and, where practicable, the opening of the fence shall be in accordance with the wishes of said owner or tenant. Contractor shall be responsible that no loss or inconvenience shall accrue to Owner or tenant by virtue of its fences having been opened or the gate not having been either shut or attended at all times. If special types of fences are encountered, Contractor shall install temporary gates made of similar materials and of suitable quality to serve the purposes of the original fences. In all cases where Contractor removes fences to obtain work room, it shall provide and install temporary fencing as required, and on completion of construction shall restore the original fence to the satisfaction of Owner. All costs of providing, maintaining and restoring gates and fencing shall be borne by Contractor. Contractor shall provide and maintain all passageways, guard fences, lights and other facilities for protection required by public authority or local conditions.

5.54.3 Contractor shall use extreme care during construction to prevent damage from dust to crops and adjacent property. Contractor, at its own expense, shall provide adequate dust control for the right-of-way and take other preventative measures as directed by Owner.

5.54.4 Contractor shall be responsible for all damage to any property resulting from trespass by Contractor or its employees in the course of their employment, or subcontractors or their employees in the course of their employment, or anyone directly or indirectly employed by any of them, whether such trespass was committed with or without the consent or knowledge of Contractor.

5.54.5 Contractor shall see that the worksite is kept drained and free of all ground water and any other water which may impede the progress or execution of the Work.

5.54.6 Contractor shall be responsible for any damage caused by drainage or water runoff from construction areas and from construction plant areas.

5.54.7 In an emergency affecting the safety of life, or of the work, or of adjoining property, Contractor, without special instruction or authorization from Owner, is hereby permitted to act at its discretion to prevent such threatened loss or injury, and it

shall so act without appeal if so instructed or authorized. Should Owner deem an emergency condition to exist, Contractor shall immediately do those things and take those steps ordered by Owner. The decision of Owner in this respect shall be final and conclusive. Any claims for compensation made by Contractor on account of emergency work shall be determined as specified under section 5.3.

5.54.8 Except as provided by California Government Code § 4215, the Contractor shall be responsible for the removal, relocation and protection of all public and private utilities, including irrigation facilities in the nature of utilities, located on the site of the construction project if and to the extent that the same are identified in the Construction Provisions; and Contractor shall not be entitled to any extension of time or claim for damages for extra compensation in connection therewith. If and to the extent that such utilities or facilities are not identified in the Construction Provisions, as between Contractor and Owner, Owner will be responsible for the cost of their removal, relocation or protection, as the case may be, but Contractor shall perform any such work in conformance with applicable provisions of section 5.3, if so directed by Owner and in such situation Contractor shall not be responsible for delay in completion of the project caused by the failure of Owner or Owner of the utility to provide for such removal or relocation. If Contractor, while performing the Work, discovers utility or irrigation facilities not identified by Owner in the Construction Provisions, it shall immediately notify Owner in writing.

5.54.9 When the work to be performed under the Agreement crosses or otherwise interferes with existing streams, watercourses, canals, farm ditches, pipelines, drainage channels, or water supplies, Contractor shall provide for such watercourse or pipelines and shall perform such construction during the progress of the work so that no damage will result to either public or private interests; and Contractor shall be liable for all damage that may result from failure to so provide during the progress of the work.

5.55 ACCIDENTS

5.55.1 Contractor shall provide and maintain, in accordance with California Labor Code § *6708* and Cal-OSHA requirements, adequate emergency first-aid treatment for its employees and anyone else who may be injured in connection with the work.

5.55.2 Contractor shall promptly report in writing to Owner all accidents of any nature arising out of, or in connection with, the performance of the work, on or adjacent to the site, which caused death, personal injury or property damage, giving full details and statements of witnesses. In addition, if death or serious injury or serious damage result, the accident shall be reported immediately by telephone or messenger to Owner.

5.55.3 If any claim is made by anyone against Contractor or any subcontractor on account of any accident, Contractor shall promptly report the facts in writing to Owner, giving full details of the claim.

5.56 NO PERSONAL LIABILITY

Neither Owner nor any of its officers, directors, agents, or employees shall be personally responsible for any liability arising under the Agreement, except such obligations as are specifically set forth herein.

5.57 MEASUREMENT OF QUANTITIES

Where the Agreement provides for payment on a lump sum price basis, no measurement of quantity will be made. Where the Agreement provides for payment on a unit price basis, the quantities of work performed will be computed by Owner on the basis of measurements taken by Owner, and these measurements shall be final and conclusive. All quantities of work computed under the Agreement shall be based upon measurements by Owner according to United States Measurements and Weights. Methods of measurement are specified herein and in the Specifications.

5.58 SCOPE OF PAYMENT

5.58.1 Contractor shall accept the compensation provided in the Contract Agreement as full payment for furnishing all labor, materials, tools, equipment, and incidentals necessary to the completed work and for performing all work contemplated and embraced under the Agreement; also for loss or damage arising from the nature of the work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the acceptance by Owner and for all risks of every description connected with the prosecution of the work; also for all expenses incurred in consequence of the suspension or discontinuance of the work as provided in the Agreement; and for completing the work according to the Specifications and Plans. Neither the payment of any estimate nor of any retained percentage shall relieve Contractor of any obligation to make good any defective work or material.

5.58.2 No compensation will be made in any case for loss of anticipated profits. Increased or decreased work involving supplemental agreements will be paid for as provided in such agreements.

5.59 PROGRESS ESTIMATE

For each calendar month of Work, Contractor shall prepare a progress estimate of all work performed under the Agreement. Within the first ten (10) days of each succeeding calendar month, Contractor shall prepare in writing and certify to Owner, an estimate which in its opinion is a fair approximation of the value of all work done under the Agreement, including any amounts due Contractor for extra work and change orders. In arriving at the value of the work done, Owner will give consideration to the value of labor and materials which have been incorporated into the permanent work by Contractor during the preceding month. Consideration will not be given to preparatory work done or for materials or equipment on hand. In order to assist Owner,

Contractor shall furnish Owner with copies of invoices for all such items delivered to the job site and incorporated into the work.

5.60 PROGRESS PAYMENTS

5.60.1 Owner shall pay Contractor as set forth in Exhibit "A" of the Contract Agreement hereto.

5.60.2 In accordance with California Public Contract Code § 20104.50, a written payment request from Contractor shall be reviewed by Owner as soon as practicable in order to determine whether it is proper. If it is determined not to be a proper payment request suitable for payment, then Owner shall return it to Contractor with a written explanation of the deficiencies as soon as practicable, but not later than seven (7) days after receipt of the payment request. If the payment request is determined to be properly submitted and is undisputed, Owner will certify the payment as provided above and Owner shall make the payment to Contractor within thirty (30) days after receipt of the payment request. If a properly submitted and undisputed payment request is not paid within this 30 day period, then Owner shall pay interest on the overdue amount to Contractor at the legal rate set forth at California Code of Civil Procedure § 685.010. This section shall not apply if Owner's funds are not available for payment of the payment request or if payment is delayed due to an audit inquiry by the financial officer of Owner.

5.60.3 RETENTION PROCEEDS; WITHHOLDING; DISBURSEMENT

In accordance with Section 7107 of the Public Contract Code with respects to all contracts entered into on or after January 1, 1993 relating to the construction of any public work of improvement the following shall apply:

1. The retention proceeds withheld from any payment by the OWNER from the original CONTRACTOR, or by the original CONTRACTOR from any subcontractor, shall be subject to this paragraph 17.18.

2. Within 60 days after the date of completion of the WORK, the retention withheld by the OWNER shall be released. In the event of a dispute between the OWNER and the original CONTRACTOR, the OWNER may withhold from the final payment an amount not to exceed 150 percent of the disputed amount. For the purposes of this paragraph, "completion" means any of the following:

a. The occupation, beneficial use, and enjoyment of a work of improvement, excluding any operation only for testing, startup, or commissioning, by the OWNER, accompanied by cessation of labor on the work of improvement.

b. The acceptance by the OWNER of the work of improvement.

c. After the commencement of a work of improvement, a cessation of labor on the work of improvement for a continuous period of 100 days or more, due to factors beyond the control of the CONTRACTOR.

d. After the commencement of a work of improvement, a cessation of labor on the work of improvement for a continuous period of 30 days or more, if the OWNER files for record a notice of cessation or a notice of completion.

3. Subject to subparagraph 17.18 A.4, within 10 days from the time that all or any portion of the retention proceeds are received by the original CONTRACTOR, the original CONTRACTOR shall pay each of its subcontractors from whom retention has been withheld, each subcontractor's share of the retention received. However, if a retention payment received by the original CONTRACTOR is specifically designated for a particular subcontractor, payment of the retention shall be made to the designated subcontractor, if the payment is consistent with the terms of the subcontract.

4. The original CONTRACTOR may withhold from a subcontractor its portion of the retention proceeds if a bona fide dispute exists between the subcontractor and the original CONTRACTOR. The amount withheld from the retention payment shall not exceed 150 percent of the estimated value of the disputed amount.

5. In the event that retention payments are not made within the time periods required by this paragraph 17.18, the OWNER or original CONTRACTOR shall be subject to a charge of 2 percent per month on the improperly withheld amount, in lieu of any interest otherwise due. Additionally, in any action for the collection of funds wrongfully withheld, the prevailing party shall be entitled to attorney's fees and costs.

6. Any attempted waiver of the provisions of this section shall be void as against the public policy of this state.

Unless otherwise prescribed by law, the OWNER may retain a portion of the amount otherwise due to the CONTRACTOR, as follows:

Retention of 5 percent of each approved progress payment until the work is 50 percent complete; then the OWNER may, at its option, refund that portion of retainage held by the OWNER that is in excess of 2 percent of the total of the WORK done to date and thereafter continue to retain 2 percent of the value of all approved progress payment requests subsequently submitted.

The OWNER may reinstate retention of the total of the WORK done if the OWNER determines, at its discretion, that the CONTRACTOR is not performing the WORK satisfactorily or there is other specific cause for such withholding.

5.60.4 When, in the judgment of Owner, the work is not proceeding in accordance with the provisions of the Agreement, or when in its judgment the total amount of the work done since the last estimate amounts to less than $1,000, no pay estimate will be prepared and no progress payment will be made.

5.60.5 No progress estimate or payment shall be considered to be an approval or acceptance of any work, materials or equipment. Estimated amounts and values of work done and materials and equipment incorporated into the work will be conformed to actual amounts and values as they become available in subsequent progress estimates, progress payments and the final estimate and payment. All estimates and payments will be subject to correction in subsequent progress estimates and payments and the final estimate and payment.

5.60.6 It is mutually agreed between the parties to the Agreement that no payments made under the Agreement, including progress payments and the final payment, shall be evidence of the performance of the Agreement, either wholly or in part, and no payment shall be construed to be an acceptance of any defective or incomplete work or improper materials.

5.60.7 Owner reserves the right to make payments jointly to the order of Contractor and to any of its subcontractors or suppliers that might have a right to file a stop notice with Owner. Owner shall have no obligation to Contractor to ensure the payment of money to a subcontractor or supplier, except as may otherwise be required by law.

5.61 FINAL ACCEPTANCE AND DATE OF COMPLETION

Whenever Contractor shall deem all work under this Agreement to have been completed in accordance therewith, it shall so notify Owner in writing. Owner shall promptly ascertain whether the work has been satisfactorily completed and, if not, shall advise Contractor in detail and in writing of any additional work required. When all the provisions of the Agreement have been fully complied with to the satisfaction of Owner, it shall proceed with all reasonable diligence to determine accurately the total value of all work performed by Contractor at the prices set forth in the Agreement or fixed by Change Orders, and the total value of all extra work, all in accordance with the Agreement. Owner will then certify to said final estimate and to the completion of the work, and will file copies thereof with Owner and Contractor. The date of completion shall be the date upon which Owner makes its formal written acceptance of the work.

5.62 FINAL PAYMENT

Within ten (10) days after the date of completion, Owner shall file in the County Recorder's office, a Notice of Completion of the work herein agreed to be done by Contractor. On the expiration of sixty (60) days after the recordation of such Notice of Completion, the difference between said final estimate and all payments theretofore made to Contractor shall be due and payable to Contractor, subject to any requirements concerning the furnishing of a maintenance bond, and excepting only such sum or sums as may be withheld or deducted in accordance with the provisions of this Agreement or as required by law. All prior certifications upon which partial payments may have been made, being merely estimates, shall be subject to correction in the final certificate. In accordance with California Public Contract Code § 7107(c), in the event of a dispute

between Owner and Contractor, Owner may withhold from the final payment an amount not to exceed 150% of the disputed amount.

5.63 FINAL RELEASE

Final payment to Contractor in accordance with the final estimate is contingent upon Contractor furnishing Owner with a signed written release of all claims against Owner arising by virtue of the Agreement. Disputed claims in stated amounts may be specifically excluded by Contractor from the operation of the release. The release shall be in substantially one of the following forms:

UNCONDITIONAL WAIVER AND RELEASE UPON FINAL PAYMENT

The undersigned has been paid in full for all labor, services, equipment or material furnished to Owner on the job of Owner located at _____, California, and does hereby waive and release any right to a mechanic's lien, stop notice, or any right against a labor and material bond on the job, except for disputed claims for extra work in the amount of $ _____.

CONTRACTOR

Dated: _____ _____ [Contractor name]

_____ [Authorized signature]

_____ [Name]

_____ [Title]

NOTICE: THIS DOCUMENT WAIVES RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN *IT*, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL RELEASE FORM.

CONDITIONAL WAIVER AND RELEASE UPON FINAL PAYMENT

Upon receipt by the undersigned of a check from Owner in the sum of $_____ payable to Contractor and when the check has been properly endorsed and has been paid by the bank upon which its is drawn, this document shall become effective to release any mechanic's lien, stop notice, or bond right the undersigned has on the job of Owner located at _____, California. This release covers the final payment to the undersigned of all labor, services, equipment or material furnished on the job, except for disputed claims for extra work in the amount of $_____. Before any recipient of this document relies on it, the party should verify evidence of payment to the undersigned.

Dated: _____ _____ [Contractor name]

_____ [Authorized signature]

_____ [Name]

_____ [Title]

5.64 RIGHT TO WITHHOLD PAYMENTS

In addition to all other rights and remedies of Owner hereunder and by virtue of law, Owner may withhold or nullify the whole or any part of any progress payment or up to 150% of the disputed amount from the final payment (see California Public Contract Code § 7107(c)) to such extent as may reasonably be necessary to protect Owner from loss on account of:

5.64.1 Defective work not remedied, irrespective of when any such work be found to be defective;

5.64.2 Claims or liens filed or reasonable evidence indicating probable filing of claims or liens including, but not limited to, claims under California Labor Code §§ 1775, 1776, or 1777.7;

5.64.3 Failure of Contractor to make payments properly for labor, materials, equipment, or other facilities, or to subcontractors and/or suppliers;

5.64.4 A reasonable doubt that the work can be completed for the balance then unearned;

5.64.5 A reasonable doubt that Contractor will complete the work within the agreed time limits;

5.64.6 Costs to Owner resulting from failure of Contractor to complete the work within the proper time; or

5.64.7 DAMAGE TO WORK OR PROPERTY.

Whenever Owner shall, in accordance herewith, withhold any monies otherwise due Contractor, written notice of the amount withheld and the reasons therefor will be given Contractor. After Contractor has corrected the enumerated deficiencies, Owner will promptly pay to Contractor the amount so withheld. When monies are withheld to protect Owner against claims or liens of mechanics, suppliers, materialmen, subcontractors, etc., Owner may at its discretion permit Contractor to deliver a surety bond in terms and amount satisfactory to Owner, indemnifying Owner against any loss or expense, and upon acceptance thereof by Owner, Owner shall release to Contractor monies so withheld.

5.65 WAIVER OF INTEREST

Owner shall have no obligation to pay and Contractor hereby waives the right to recover interest with regard to monies that Owner is required to withhold by reason of judgment, order, statute or judicial process, or may withhold pursuant to the provisions of this Agreement.

5.66 SATISFACTION OF CLAIMS AND LIENS

Neither the final payment nor any part of the retained percentage shall become due until Contractor, if required, shall deliver to Owner, a complete release of all liens and claims arising out of this Agreement, or receipts in full in lieu thereof and, if required in either case, an affidavit that so far as it has knowledge or information the releases and receipts include all the labor and material for which a lien or claim could be filed; but Contractor may, if any subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to Owner, to indemnify Owner against any lien or claim. If any lien or claim remains unsatisfied after all payments are made, Contractor shall refund to Owner all monies that the latter may be compelled to pay in discharging such a lien, or claim, including all costs and reasonable attorney's fees.

5.67 ASSIGNMENT OF RIGHTS, TITLE AND INTEREST

In accordance with California Public Contract Code § 7103.5, Contractor hereby offers and agrees to assign to Owner all rights, title, and interest in and to all causes of action it may have under § 4 of the Clayton Act (15 U.S.C. § 15) or under the Cartwright Act (Chapter 2 (commencing with § 16700) of part 2 of division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the Construction Provisions. This assignment shall be made and become effective at the time Owner tenders final payment to Contractor, without further acknowledgment by the parties.

5.68 AVAILABILITY AND AUDIT OF INFORMATION

5.68.1 Owner's duly authorized representatives shall have, during the term of the Agreement and for two years thereafter, the right to inspect, copy and audit all of Contractor's and its subcontractors' accounts and records of all description, including but not limited to source documents and computer files, and to interview personnel, pertaining to the Agreement to verify or review the quantity, quality, work program and progress of the work, reimbursable costs, amounts claimed by Contractor, estimates of cost for fixed rates including those applicable to proposed changes, and for any other reasonable purposes.

5.68.2 Contractor's and its subcontractors' accounts shall be kept in accordance with generally accepted accounting principles in the particular industry and shall be kept in such a manner and in sufficient detail to clearly disclose the nature and amounts of the different items of service and cost pertaining to the Agreement and the basis for charges

or allocations to the Agreement. Contractor and its subcontractors shall preserve all such accounts and records for a period of two years after the term of the Agreement.

5.68.3 Contractor shall include the necessary provisions in its subcontracts to ensure that its subcontractors comply with this provision.

5.68.4 The parties acknowledge that this Agreement, and performance and payments under this Agreement, are subject to examination and audit by the State Auditor General for three years following final payment under this Agreement pursuant to California Government Code § 8546.7.

5.69 HAZARDOUS MATERIALS

The California Health and Safety Code requires businesses to provide warnings prior to exposing individuals to materials listed by the Governor as chemicals "known to cause cancer or reproductive toxicity." Owner may use chemicals on the Governor's list at many of its facilities. In addition, many of these chemicals are present at non-Owner-owned facilities and locations. Accordingly, in performing the work or services contemplated under this Agreement, Contractor, its employees, agents, and subcontractors may be exposed to chemicals on the Governor's list. Contractor is responsible for notifying its employees, agents, and Subcontractors that work performed hereunder may result in exposures to chemicals on the Governor's list.

The Project may involve the removal of asbestos and lead paint. Contractor is responsible for reviewing the plans and specifications and the site conditions to properly assess the Project. To the extent the Project involves or requires the removal of asbestos and lead paint or other hazardous materials, Contractor shall be responsible for the removal and disposal of such material. Contractor shall comply with all local, state and federal laws involving the removal and disposal of such material and if not licensed to complete such work, shall contract with properly licensed subcontractors for the completion of the work.

5.70 INTEGRATION

The Construction Provisions constitute the sole, final, complete, exclusive and integrated expression and statement of the terms of this Agreement among the parties concerning the subject matter addressed herein, and supersedes all prior negotiations, representations or agreements, either oral or written, that may be related to the subject matter of this Agreement, except those other documents that are expressly referenced in the Construction Provisions.

5.71 WAIVER

The waiver at any time by any party of its rights with respect to a default or other matter arising in connection with this Agreement shall not be deemed a waiver with respect to any subsequent default or matter.

5.72 REMEDIES NOT EXCLUSIVE

The remedies provided in this Agreement are cumulative and not exclusive, and are in addition to any other remedies that may be provided by law or equity. The exercise by either party of any remedy under this Agreement shall be without prejudice to the enforcement of any other remedy.

5.73 SEVERABILITY

The invalidity, illegality or unenforceability of any provision of the Construction Provisions shall not render the other provisions unenforceable, invalid or illegal.

5.74 GOVERNING LAW AND VENUE

Except as otherwise required by law, this Agreement shall be interpreted, governed by, and construed under the laws of the State of California. El Dorado County shall be the venue for any litigation concerning the enforcement or construction of this Agreement.

SECTION 01010 - SUMMARY OF WORK

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The WORK to be performed under this Contract shall consist of furnishing plant, tools, equipment, materials, supplies, and manufactured articles, and furnishing all labor, transportation, and services, including fuel, power, water, and essential communications, and performing all work or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents. The WORK shall be complete, and all work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the WORK in good faith shall be provided by the CONTRACTOR as though originally so indicated, at no increase in cost to the OWNER.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The work includes structural design and construction of a 285,000 gallon capacity welded steel reservoir (“tank”) in accordance with AWWA D100-21, for the purpose of treated potable water for the Grizzly Flats community. Performance and prescriptive criteria (specifications and plans) were provided by Owner for project bid, however final construction documents are the responsibility of the tank designer, including foundation. Work includes preparing and grading site for tank pad, locating utilities, demolition work, tank foundation, tank, installation of tank inlet/outlet piping and appurtenances, overflow pipe, tank access, interior and exterior coatings, electrical conduit and grounding, relocation of existing utilities, erosion control systems, site security, disinfection and testing of pipes and tank, clean-up of site, and other work as needed to provide a complete and functioning potable water tank as defined in the contract documents and applicable construction standards.

B. The WORK is located at the OWNER's District Office and water treatment plant site, 4765 Sciaroni Road, Grizzly Flats, California.

C. A principal item of the Work is for CONTRACTOR to ensure public safety, as well as minimize noise, dust, traffic, and other disruption or danger to the public. Work shall include, but is not limited to, site security and fencing, dust control, etc. No materials or equipment shall be stored or parked in areas outside of designated work or staging areas.

1.3 EXISTING CONDITIONS AND REPORTS

A geotechnical report for the site was prepared by Owner. Design and construction shall follow report recommendations, unless (1) the tank designer determines soil report data and/or conclusions are insufficient for design (designer sends request for additional information or clarification), or (2) existing site conditions are not accurately reflected in the soils report (contractor to ask Engineer for soil engineer opinion). CONTRACTOR is responsible for all soil preparation, grading, and installing select materials as necessary for construction of tank foundation, floor, drainage basins, and piping.

1.4 UTILITIES

The following utilities may be encountered on this project, and it shall be the Contractor's responsibility to contact each 48 hours prior to commencement of the work and at such other times that it becomes necessary to desirable during construction:

1. UNDERGROUND SERVICE ALERT: (800) 227-2600
2. PG&E (Maintain clearances from overhead power).
3. ATT (overhead phone)
4. Owner underground improvements (water pipes, electrical conduit, sewer pipes)

The Contractor shall locate, preserve and protect from damage all surface and underground utilities within the area of construction.

1.5 CONTRACT METHOD

A. The WORK hereunder will be constructed under a combination of lump sum bid items.

1.6 WORK BY OTHERS

A. Where 2 or more contracts are being performed at one time on the same Site or adjacent land in such manner that work under one contract may interfere with work under another, the OWNER will determine the sequence and order of the Work in either or both contracts. When the Site of one contract is the necessary or convenient means of access for performance of work under another, the OWNER may grant privilege of access or other reasonable privilege to the contractor so desiring, to the extent, amount, and in manner and at time that the OWNER may determine. No OWNER determination of method or time or sequence or order of the work or access privilege shall be the basis for a claim for delay or damage except under provisions of the General Conditions for temporary suspensions of the work. 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 allow continued safe access to their respective portions of the Site, as required to perform work under their respective contracts.

B. **Interference With Work On Utilities:** The CONTRACTOR shall cooperate fully with all utility forces of the OWNER 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.

1.7 WORK SEQUENCE

A. The WORK shall be completed in the following general sequence: Locate utilities in work areas, establish site access/security/temporary utilities, mobilize, demolition of existing tank, grubbing, grading, foundation, construct tank and appurtenances, underground pipe and conduit, above grade piping, valve vaults, coatings, disinfect and commission, project close out and site clean up.

1.8 CONTRACTOR USE OF SITE

A. The CONTRACTOR's use of the Site shall be limited to its construction operations, including temporary on-Site storage of materials, equipment, and debris. CONTRACTOR shall provide a plan to ENGINEER for approval of locations for storage areas.

B. CONTRACTOR shall provide security measures to protect the public from access to work areas and equipment. Temporary fencing shall be established around work areas. Equipment shall be parked within fenced areas during non-work hours. Fencing shall include signs stating “Do Not Enter”. During work hours while the contractor is present, CONTRACTOR shall only allow authorized persons to enter site. Site access gate shall remained closed when there are no vehicles entering or leaving the site.

1.9 OUTAGE PLAN AND REQUESTS

A. Unless the Contract Documents indicate otherwise, the CONTRACTOR shall not remove from service, de-energize, or modify settings for any existing operating pipe, valve, channel, equipment, structure, road, or any other facility without permission from the ENGINEER. Any outage will require a written plan approval by ENGINEER in advance of said work.

B. Not Used.

C. CONTRACTOR shall call for Underground Service Alert prior to start of Work.

D. The ENGINEER shall be notified in writing at least one week in advance of the required outage if the schedule for performing the work has changed or if revisions to the outage plan are required.

1.10 OWNER USE OF THE SITE

A. The OWNER may utilize all or part of the site and existing facilities during the entire period of construction. The CONTRACTOR shall cooperate and coordinate with the OWNER and ENGINEER to facilitate the OWNER's operations and to minimize interference with the CONTRACTOR's operations at the same time. In any event, the OWNER shall be allowed access to the Site during the period of construction. CONTRACTOR shall not operate any valve or equipment at the site without approval and presence of OWNER.

1.11 PARTIAL UTILIZATION OF THE WORK BY OWNER

A. Prior to final acceptance, the OWNER may take partial utilization of the WORK for completion of the piping connections to other work at the site, adding depth instruments, tank hatch security, etc.

1.42 PROJECT MEETINGS

A. **Preconstruction Conference:**

1. Prior to the commencement of WORK at the Site, a preconstruction conference will be held at a mutually agreed time and place. The conference shall be attended by the CONTRACTOR'S Project Manager, its superintendent, and its Subcontractors as the CONTRACTOR deems appropriate. Other attendees will be:

    a. ENGINEER and the Resident Project Representative.

    b. Representatives of OWNER.

    c. Governmental representatives as appropriate.

d. Others as requested by CONTRACTOR, OWNER, or ENGINEER.

2. The CONTRACTOR shall bring the preconstruction conference submittals in accordance with Section 01300 - Contractor Submittals.

3. 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. However, the CONTRACTOR should be prepared to discuss all of the items listed below.

   a. Status of CONTRACTOR's insurance and bonds.

   b. CONTRACTOR's tentative schedules.

   c. Transmittal, review, and distribution of CONTRACTOR's submittals.

   d. Processing applications for payment.

   e. Maintaining record documents.

   f. Critical work sequencing.

   g. Field decisions and Change Orders.

   h. Use of Site and storage areas, security, housekeeping, and OWNER's needs.

   i. Major equipment deliveries and priorities.

   j. CONTRACTOR's assignments for safety and first aid.

   k. Daily Report Form which the ENGINEER will furnish.

   l. Submittal Transmittal Form which the ENGINEER will furnish.

4. The ENGINEER will preside at the preconstruction conference and will arrange for keeping and distributing the minutes to all persons in attendance.

5. The CONTRACTOR and its Subcontractors should plan on the conference taking no less than 4 hours.

B. **Progress Meetings:**

1. The CONTRACTOR shall schedule and hold regular on-Site progress meetings at least weekly and at other times as requested by ENGINEER or as required by progress of the WORK. The CONTRACTOR, ENGINEER, and all Subcontractors active on the Site shall attend each meeting. CONTRACTOR may at its discretion request attendance by representatives of its Suppliers, manufacturers, and other Subcontractors.

2. The ENGINEER will preside at the progress meetings and will arrange for keeping and distributing the minutes. The purpose of the meetings is to review the progress of the WORK, maintain coordination of efforts, discuss changes in scheduling, and

resolve other problems which may develop. During each meeting, the CONTRACTOR shall present any issues which may impact its progress with a view to resolve these issues expeditiously.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

- END OF SECTION -

SECTION 01025 - MEASUREMENT AND PAYMENT

PART 1 -- GENERAL

1.1 SCOPE

A. Payment for the various items of the Bid Schedule, as further specified herein, shall include all compensation to be received by the CONTRACTOR for furnishing and purchasing all tools, equipment, supplies, materials, 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 the WORK all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of permits and cost 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 Schedule, and all costs therefore shall be included in the prices named in the Bid Schedule for the various appurtenant items of work.

1.2 SHEETING, SHORING, AND BRACING (Bid Item No. 1)

A. No measurement shall be made for this item.

B. Payment for temporary sheeting, shoring, and bracing or equivalent method will be made at the lump-sum price named in the Bid Schedule(s) under Item No. 1 which price shall constitute full compensation for completion of all planning, design, engineering fees, furnishing and constructing, and removal and disposal of such temporary sheeting, shoring, and bracing as a lump-sum item, complete, 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.

1.3 MOBILIZATION (Bid Item No. 2)

Payment for Mobilization shall be based on a lump sum (L.S.) price. Work shall include, but is not limited to, submittals (including structural calculations for welded tank and foundation with California professional engineer stamp), mobilization of equipment, temporary services, meetings, outage plans, maintaining erosion control measures, locating utilities, general correspondence, insurance, bonds, security, clean up, and all other miscellaneous work as defined in the contract documents but not included in the following Items of Work herein.

1.4 EXISTING BOLTED STEEL TANK DEMOLITION (Bid Item 3)

Payment for Existing Bolted Steel Tank Demolition shall be based on a lump sum (L.S.) price. Work shall include, but is not limited to, isolating and draining tank, disassembly and removal of tank, removal and disposal of steel base soil retainer ring, removal and disposal of wood sheds, and removal and disposal of miscellaneous equipment. Dismantling of tank will be performed by unbolting plates (no cutting or heavy equipment manipulation). Owner reserves the right to salvage miscellaneous equipment (valves, pipe fittings, instruments, electronics, etc.). Clean work area of all parts, scraps, shavings, connectors, chips, etc.

1.5 SITE PREPARATION (Bid Item No.4)

Payment for Site Preparation shall be based on a lump sum (L.S.) price. Work shall include, but is not limited to, grubbing, grading, retaining walls, earthwork, and other miscellaneous work as needed to prepare the site and access for tank construction.

1.5 SITE UNDERGROUND AND PIPING (Bid Item No. 5)

Payment for Site Underground and Piping shall be based on a lump sum (L.S.) price. Work shall include, but is not limited to, pipe modifications and connections, installation of altitude valve/vault/sensing line, drain/overflow inlets and drainage pipes, electrical conduit, pull boxes, and other work as needed to allow water service operations to continue during tank construction.

1.6 CONCRETE RINGWALL FOUNDATION (Bid Item No.6)

Payment for Concrete Ringwall Foundation shall be based on a lump sum (L.S.) price. Work shall include, but is not limited to, trenching, formwork, reinforcement, concrete installation, finish, and curing, and compaction of fill and select material inside ringwall following adequate curing, etc.

1.7 WELDED STEEL TANK (Bid Item No. 7)

Payment for Welded Steel Tank shall be based on a lump sum (L.S.) basis. Work shall include, but is not limited to, steel panel fabrication, factory primer coatings, erection of tank, appurtenances (roof access, vent, sample port and box, conduit supports, level transmitter port, altitude sensing line and port, etc.), inlet/outlet pipes, fittings, valves, couplers, connections to existing pipes, tank/foundation seal, etc., all in accordance with AWWA D100 and these contract documents.

1.8 STEEL TANK COATINGS (Bid Item No. 8)

Payment for Steel Tank Coatings shall be based on a Lump Sum (L.S.) price. Work shall include, but is not limited to, preparing surfaces for coating, applying coatings, provide and use of coating instrumentation for determining proper application conditions and finish coating thicknesses, providing a secure coating and material storage container, safety equipment, submit a plan to addressing overspray conditions, ensuring compliance with air quality codes and regulations, all equipment necessary to apply coatings in accordance with manufacturer's recommendations, touch up, and clean up.

1.9 TANK DISINFECTION, TESTING, AND COMMISSIONING (Bid Item No. 9)

Payment for Tank Disinfection, Testing, and Commissioning shall be based on a Lump Sum (L.S.) price. Work shall include but is not limited to, disinfection of tank interior, leakage testing, and assisting the OWNER with placing the tank into service.

1.10 ALTERNATE BID ITEMS

A. PRECAST MASONRY LANDSCAPE WALL

Payment for Precast Masonry Landscape Wall shall be based on a Lump Sum (L.S.) price. Work shall include but is not limited to, materials, labor, and equipment necessary to install the landscape wall as shown on the drawings, and per manufacturer's recommendations.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

- END OF SECTION -

SECTION 01300 - CONTRACTOR SUBMITTALS

PART 1 -- GENERAL

1.1 GENERAL

A. Wherever submittals are required in the Contract Documents, submit them to the ENGINEER. Submittals shall include those listed herein.

1. Submittals are required on all materials to be provided and part of the completed Work, including but not limited to, pipe, conduit, valves, pipe fittings, concrete, concrete vaults, steel reinforcement, conductors, select fill, coatings, etc.

2. Fabricated products, including but not limited to, steel tanks, steel pipes, roof hatches, etc., shall include detailed shop fabrication drawings required for material production.

3. Other miscellaneous submittals that are required for construction activities, including but not limited to, outage plans, utility protection plans, schedules, permits, stagging plans, disinfection and testing plans, start up plans, etc.

B. Within 7 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 preliminary schedule of Shop Drawings, Samples, Work Plans, and proposed Substitutes ("Or-Equal") submittals listed in the Bid.

2. A list of all permits and licenses the CONTRACTOR shall obtain indicating the agency required to grant the permit and the expected date of submittal for the permit and required date for receipt of the permit.

1.2 PRECONSTRUCTION CONFERENCE SUBMITTALS

A. At the preconstruction conference referred to in Section 01010 - Summary of Work, the CONTRACTOR shall submit the following items to the ENGINEER for review:

1. A preliminary schedule of Shop Drawings, Samples, and proposed Substitute ("Or-Equal") submittals listed in the Bid, unless previously provided per Item 1.1.

2. A list of all permits and licenses the CONTRACTOR shall obtain indicating the agency required to grant the permit, the expected date of submittal for the permit, and required date for receipt of the permit, unless previously provided per Item 1.1.

3. A work schedule in accordance with Item 1.B.1.

4. Proposed staging plan for material, equipment, and debris storage.

5. Utility outage and protection plans.

1.3 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, an electronic pdf version to all required parties as identified in the Pre Construction meeting. The term "Shop Drawings" as used herein shall be understood to include detail design calculations, shop-prepared drawings, fabrication, and installation drawings, erection drawings, lists, graphs, catalog sheets, data sheets, and similar items. Whenever the CONTRACTOR is required to submit design calculations as part of a submittal, such calculations shall bear the signature and seal of an engineer registered in the appropriate branch and in the state wherein the project is to be built, unless otherwise indicated.

B. Shop Drawing submittals shall be accompanied with a transmittal form that defines the submittal date, submittal content, number of copies, where submittals are to be returned, what section or part of the project the submittal addresses (i.e. ductile iron pipe for water supply from well to tank), and what action the CONTRACTOR requires (i.e. For Review, Resubmittal from Comments dated August 10, etc.). Any submittal not accompanied by such a form, or where all applicable items on the form are not completed, with be returned for resubmittal.

C. Organization

1. A single submittal transmittal form shall be used for each technical specification section or item or class of material or equipment for which a submittal is required. A single submittal covering multiple sections will not be acceptable, unless the primary specification references other sections for components. Example: if a pump section references other section for the motor, protective coating, anchor bolts, local control panel, and variable frequency drive, a single submittal would be accepted; a single submittal covering vertical turbine pumps and horizontal split case pumps would not be acceptable.

2. On the transmittal form, index the components of the submittal and insert tabs in the submittal to match the components. Relate the submittal components to Specification paragraph and subparagraph, Drawing number, detail number, schedule title, or room number, or building name, as applicable.

3. Unless indicated otherwise, terminology and equipment names and numbers used in submittals shall match the Contract Documents.

D. Format

1. Every page in a submittal shall be numbered in sequence.

2. Where product data from a manufacturer is submitted, clearly mark which model is proposed, with all pertinent data capacities, dimensions, clearances, diagrams, controls, connections, anchorage, and supports. Sufficient level of detail shall be presented for assessment of compliance with the Contract Documents.

3. Each submittal shall be assigned a unique number. Submittals shall be numbered sequentially. The submittal numbers shall be clearly noted on the transmittal. Original submittals shall be assigned a numeric submittal number. Resubmittals shall bear an alpha-numeric system which consists of the number assigned to the original submittal for that item followed by a letter of the alphabet to represent that it is a subsequent submittal of the original. For example, if submittal 25 requires a resubmittal, the first resubmittal will bear the designation 25-A and the second

resubmittal will bear the designation 25-B and so on.

E. Disorganized submittals which do not meet the requirements above will be returned without review.

F. Except as may otherwise be indicated herein, the ENGINEER will return an electronic pfd version of each submittal to the CONTRACTOR with its comments noted thereon, within 30 calendar days following receipt by the ENGINEER. However, if a submittal review is needed in a faster time to meet project timeframes or deadlines, CONTRACTOR shall specify submittal to be accelerated. In such circumstances, ENGINEER will attempt to return submittal in less than 10 days.

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 OWNER reserves the right to withhold monies due to the CONTRACTOR to cover additional costs of the ENGINEER's review beyond the second submittal. The ENGINEER'S maximum review period for each submittal, including all resubmittals, will be 30 days per submittal. Thus, for a submittal that requires two resubmittals before it is complete, the maximum review period for that submittal could be 90 days.

G. If a submittal is returned to the CONTRACTOR marked "NO EXCEPTIONS TAKEN," formal revision and resubmission of said submittal will not be required.

H. If a submittal is returned marked "MAKE CORRECTIONS NOTED," CONTRACTOR shall make the corrections on the submittal, but formal revision and resubmission of said submittal will not be required.

I. If a submittal is returned marked "AMEND-RESUBMIT," the CONTRACTOR shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the ENGINEER for review.

J. If a submittal is returned marked "REJECTED-RESUBMIT," it shall mean that the submitted material or product does not satisfy the specification, the submittal is so incomplete that it cannot be reviewed, or is a substitution request which will not be reviewed because it is submitted after award of the Contract. The CONTRACTOR shall prepare a new submittal and shall resubmit the required number of copies of said revised submittal to the ENGINEER for review.

K. Fabrication of an item shall be commenced only after the ENGINEER has reviewed the pertinent submittals and returned copies to the CONTRACTOR marked either "NO EXCEPTIONS TAKEN" or MAKE CORRECTIONS NOTED." Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as changes to the contract requirements.

L. All submittals shall be carefully reviewed by an authorized representative of the CONTRACTOR, prior to submission 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. The ENGINEER will only review submittals which have 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.

M. The ENGINEER's review of submittals shall not relieve the CONTRACTOR of the entire responsibility for the correctness of details and dimensions. The CONTRACTOR shall assume all responsibility and risk for any misfits due to any errors in submittals. The CONTRACTOR shall be responsible for the dimensions and the design of adequate connections and details.

1.4 CONTRACTOR'S SCHEDULE

A. The CONTRACTOR's construction schedules and reports shall be prepared and submitted to the ENGINEER in accordance with of Section 01311.

1.5 SAMPLES

A. Whenever in the Specifications samples are required, the CONTRACTOR shall submit not less than (3) samples of each item or material to the ENGINEER for acceptance.

B. Unless otherwise indicated, samples, shall be submitted a minimum of (21) days prior to ordering such material.

C. Samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and Manufacturer's name. Upon receiving acceptance of the ENGINEER, one (1) set of the samples will be stamped and dated by the ENGINEER and returned to the CONTRACTOR.

D. Unless indicated otherwise, all colors and textures of items presented in sample submittals shall be from the manufacturer's standard colors and standard materials, products, or equipment lines. If the samples represent non-standard colors, materials, products, or equipment lines and their selection will require an increase in Contract Times or Price, the CONTRACTOR shall clearly indicate same on the transmittal page of the submittal.

E. The CONTRACTOR shall schedule sample submittals such that:

1. Samples are submitted in an orderly sequence which allows the ENGINEER 45 Days to assemble color panels and select color and texture dependent products and materials without delay to the construction schedule.

2. The CONTRACTOR has sufficient time after approval or selection of color or texture to provide the products or materials without delay to the construction schedule. The Contract Times will not be extended for the CONTRACTOR’s failure to allow enough review and approval or selection time, failure to submit all samples requiring color or texture selection, or failure to submit complete or approvable samples.

1.6 TECHNICAL MANUALS

Provide technical manuals for the following:

Roof Access Doors and equipment

1.7 RECORD DRAWINGS

A. The CONTRACTOR shall maintain one record set of Drawings at the Site. On these, it shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the information represented on the original Contract

Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which 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. These master record drawings of the CONTRACTOR's representation of as-built conditions, including all revisions made necessary by addenda and change orders shall be maintained up-to-date during the progress of the WORK. Red ink shall be used for alterations and notes. Notes shall identify relevant Change Orders by number and date.

B. Copies of the record drawings shall be submitted on the 20th working day of every third month after the month in which the Notice to Proceed is given as well as on completion of WORK. Failure to submit complete record drawings on or before the 20th working day will enact the liquidated damages clause for interim record drawings submittals described in Article 3 of the Agreement.

C. In the case of those drawings which depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, the record drawings shall be updated by indicating those portions which are superseded by change order drawings or final Shop Drawings, and by including appropriate reference information describing the change orders by number and the Shop Drawings by manufacturer, drawing, and revision numbers.

D. Record drawings shall be accessible to the ENGINEER at all times during the construction period.

E. Final payment will not be acted upon until the record drawings have been prepared and delivered to the ENGINEER. Said up-to-date record drawings shall be in the form of a set of prints with carefully plotted information overlaid.

F. Upon Substantial Completion of the WORK and prior to final acceptance, the CONTRACTOR shall finalize and deliver a complete set of electronic (pdf) record drawings to the ENGINEER for transmittal to the OWNER, conforming to the construction records of the CONTRACTOR. This set of drawings shall consist of corrected Drawings 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 correct, and the CONTRACTOR shall be responsible for the accuracy of such information, and for any errors or omissions which may appear on the record drawings as a result.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

- END OF SECTION -

SECTION 01301 - SCHEDULE OF VALUES

PART 1 -- GENERAL

1.1 GENERAL

A. This Section defines the process whereby the Schedule of Values shall be developed and incorporated into the cost loading function of the CPM Schedule as specified in Section 01311 - Scheduling and Reporting. Monthly progress payment amounts shall be determined from the monthly progress updates of the CPM Schedule activities.

B. The Schedule of Values shall be developed independent but simultaneous with the development of the CPM Schedule activities and logic.

1.2 PRELIMINARY SCHEDULE OF VALUES

A. Not Used.

B. Not Used.

1.3 DETAILED SCHEDULE OF VALUES

A. The CONTRACTOR shall prepare and submit a detailed Schedule of Values to the ENGINEER within 30 days from the date of Notice to Proceed. The detailed Schedule of Values shall be based on the accepted preliminary Schedule of Values for major WORK components. Because the ultimate requirement is to develop a detailed Schedule of Values sufficient to determine appropriate monthly progress payment amounts through cost loading of the CPM Schedule activities, sufficient detailed breakdown shall be provided to meet this requirement. The ENGINEER shall be the sole judge of acceptable numbers, details and description of values established. If, in the opinion of the ENGINEER, a greater number of Schedule of Values items than proposed by the CONTRACTOR is necessary, the CONTRACTOR shall add the additional items so identified by the ENGINEER.

1. The minimum detail of breakdown of the major WORK components (Bid Items per Section 1025) is as follows. Each sub-item price includes materials, labor, installation, programming, calibration, testing, and other incidentals. Greater detail shall be provided as directed by the ENGINEER.

a. Mobilization – Mobilization, permits, submittals, meetings, training, testing/start-up/commissioning, record drawings, insurances, and temporary utilities.

b. Existing Tank Demolition – Isolating and draining tank, disassembly, loading and transporting, disposal, clean up.

c. Site Preparation - Grubbing, rough grading, retaining walls, earthwork, final grading.

d. Site Underground and Piping – Trenching, pipe, electrical conduit, pipe connections (new to existing), pull boxes, and capping existing pipe.

c. Concrete Ringwall Foundation – Trenching and formwork, reinforcing steel, concrete installation and finish, compaction of fill and select material inside of ringwall.

d. Welded Steel Tank – Steel panel fabrication, factory primer coatings, erection of tank and appurtenances, inlet/outlet pipe, fittings, valves, and connections to existing pipes.

e. Steel Tank Coatings – Interior and exterior coatings, specialized equipment for proper coating appliation.

f. Tank Disinfection, Testing, and Commissioning – Cleaning, disinfection, and testing.

h. All other WORK not specifically included in the above items shall be broken down as necessary for establishment of pay and Schedule activity items.

2. The CONTRACTOR and ENGINEER shall meet and jointly review the detailed Schedule of Values within 35 days from the date of Notice to Proceed. The value allocations and extent of detail shall be reviewed to determine any necessary adjustments to the values and to determine if sufficient detail has been proposed to allow acceptable cost loading of the CPM Schedule activities. Any adjustments deemed necessary to the value allocation or level of detail shall be made by the CONTRACTOR and a revised detailed Schedule of Values shall be submitted within 40 days from the date of Notice to Proceed.

3. Following acceptance of the detailed Schedule of Values, the CONTRACTOR shall incorporate the values into the cost loading portion of the CPM Schedule. The CPM activities and logic shall have been developed concurrent with development of the detailed Schedule of Values; however, it shall be necessary to adjust the detailed Schedule of Values to correlate to individual Schedule activities. It is anticipated that instances will occur, due to the independent but simultaneous development of the Schedule of Values and the CPM Schedule activities, where interfacing these two documents will require changes to each document. Schedule activities may need to be added to accommodate the detail of the Schedule of Values. Schedule of Value items may need to be added to accommodate the detail of the CPM Schedule activities. Where such instances arise, the CONTRACTOR shall propose changes to the Schedule of Values and to the CPM Schedule activities to satisfy the CPM Schedule cost loading requirements.

1.4 CROSS REFERENCE LISTING

A. To assist in the correlation of the Schedule of Values and the CPM Schedule, the CONTRACTOR shall provide a Cross Reference Listing which shall be furnished in two parts. The first part shall list each Scheduled Activity with the breakdown of the respective valued items making up the total cost of the activity. The second part shall list the valued item with the respective Scheduled Activity or Activities that make up the total cost indicated. In the case where a number of schedule items make up the total cost for a valued item (shown in the Schedule of Values) the total cost for each scheduled item should be indicated.

B. These listings shall be updated and submitted in conjunction with the CPM monthly submittals as stated in Specification Section 01311.

C. Approved change orders reflected in the CPM Schedule shall be incorporated into the Schedule of Values as a single unit identified by the change order number.

1.5 CHANGES TO SCHEDULE OF VALUES

A. Changes to the CPM Schedule which add activities not included in the original schedule but included in the original WORK (schedule omissions) shall have values assigned as approved by the ENGINEER. Other activity values shall be reduced to provide equal value adjustment increases for added activities as approved by the ENGINEER.

B. In the event that the CONTRACTOR and ENGINEER agree to make adjustments to the original Schedule of Values because of inequities discovered in the original accepted detailed Schedule of Values, increases and equal decreases to values for activities may be made.

1.6 LIQUIDATED DAMAGES

A. The Schedule of Values information is an integral part of the scheduling and reporting under Section 01311 and the progress payment information. As such, it is critical information to evaluating the project's progress and the proper planning of the OWNER's and ENGINEER's work effort as well as their financial obligations associated with this project. Accordingly, if any submittal required by this Section is found to be incomplete or is submitted later than required, the OWNER will suffer financial loss and, accordingly, liquidated damages will be assessed against the CONTRACTOR in accordance with the contract documents.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

- END OF SECTION -

SECTION 01400 - QUALITY CONTROL

PART 1 -- GENERAL

1.1 DEFINITION

A. Specific quality control requirements for the WORK are indicated throughout the Contract Documents. The requirements of this Section are primarily related to performance of the WORK beyond furnishing of manufactured products. The term "Quality Control" includes inspection, sampling and testing, and associated requirements.

1.2 INSPECTION AT PLACE OF MANUFACTURE

A. Unless otherwise indicated, all products, materials, and equipment shall be subject to inspection by the ENGINEER at the place of manufacture.

B. The presence of the ENGINEER at the place of manufacturer, however, shall not relieve the CONTRACTOR of the responsibility for providing products, materials, and equipment which comply with all requirements of the Contract Documents. Compliance is a duty of the CONTRACTOR, and said duty shall not be avoided by any act or omission on the part of the ENGINEER.

1.3 SAMPLING AND TESTING

A. Unless otherwise indicated, all sampling and testing will be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered; however, the OWNER reserves the right to use any generally-accepted system of sampling and testing which, in the opinion of the ENGINEER will assure the OWNER that the quality of the workmanship is in full accord with the Contract Documents.

B. Any waiver by the OWNER 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 testing or other quality assurance requirements originally indicated, 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 requirements of the Contract Documents.

C. Notwithstanding the existence of such waiver, the ENGINEER reserves 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.

1.4 INSPECTION AND TESTING SERVICE

A. Inspection and testing laboratory service shall comply with the following:

1. Unless indicated otherwise by the Contract Documents, the OWNER will appoint, employ, and pay for services of an independent firm to perform inspection and testing or will perform inspection and testing itself.

2. The OWNER or independent firm will perform inspections, testings, and other services as required by the ENGINEER under Paragraph 1.3C above.

3. Reports of testing performed by CONTRACTOR shall be submitted to the ENGINEER, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

4. The CONTRACTOR shall cooperate with the OWNER or independent firm and furnish samples of materials, design mix, equipment, tools, storage, and assistance as requested.

5. The CONTRACTOR shall notify ENGINEER 72 hours prior to the expected time for operations requiring inspection and laboratory testing services.

6. Retesting required because of non-conformance to requirements shall be performed by the same independent firm on instructions by the ENGINEER. The CONTRACTOR shall bear all costs from such retesting.

7. For samples and tests required for CONTRACTOR'S use, the CONTRACTOR shall make arrangements with an independent firm for payment and scheduling of testing. The cost of sampling and testing for the CONTRACTOR'S use shall be the CONTRACTOR'S responsibility.

1.5 CONTROL AND LAYOUT

Initial layout of the work will be the responsibility of the Owner and the Contractor. Owner shall set vertical control at a location acceptable to Contractor, and locate the center of the tank. Contractor shall use these control points and property lines/corners for further layout. Any additional staking or staking due to lost or destroyed stakes will be paid for by the Contractor and the associated costs will be deducted from the Contractor's payments. Contractor shall notify Owner or Owner's representative a minimum of 5 working days prior to requiring staking.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION

3.1 INSTALLATION

A. **Inspection**: The CONTRACTOR shall inspect materials or equipment upon the arrival on the job site and immediately prior to installation, and reject damaged and defective items.

B. **Measurements**: The CONTRACTOR shall verify measurements and dimensions of the WORK, as an integral step of starting each installation.

C. **Manufacturer's Instructions**: Where installations include manufactured products, the CONTRACTOR shall comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in Contract Documents.

- END OF SECTION -

SECTION 01560 - TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 -- GENERAL

1.1 EXPLOSIVES AND BLASTING

A. The use of explosives on the WORK will not be permitted.

1.2 DUST ABATEMENT

A. The CONTRACTOR shall 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 dust originating from its operations. The dust abatement measures shall be continued until the CONTRACTOR is relieved of further responsibility by the ENGINEER.

1.3 RUBBISH CONTROL

A. During the progress of the WORK, the CONTRACTOR shall keep the Site and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The CONTRACTOR shall dispose of all rubbish and waste materials of any nature occurring at the 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 and surplus materials shall be off the Site 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 Part 1926 of the OSHA Safety and Health Standards for Construction.

1.4 NOISE

A. CONTRACTOR shall adhere to City noise restrictions. All work shall be conducted between the hours of 8 a.m. and 6 p.m., unless authorized by City personnel for special circumstances. All equipment shall have noise attenuation devices, including trucks, heavy equipment, and generators.

1.4 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 Part 1926 of the OSHA Standards for Construction.

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.

1.5 CHEMICALS

A. 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. In addition, see the requirements set forth in paragraph 6.11 of the General Conditions.

1.6 CULTURAL RESOURCES

A. The CONTRACTOR's attention is directed to the National Historic Preservation Act of 1966 (16 U.S.C. 470) and 36 CFR 800 which provides for the preservation of potential historical architectural, archaeological, or cultural resources (hereinafter called "cultural resources").

B. The CONTRACTOR shall conform to the applicable requirements of the National Historic Preservation Act of 1966 as it relates to the preservation of cultural resources.

C. In the event potential cultural resources are discovered during subsurface excavations at the site of construction, the following procedures shall be instituted:

1. The ENGINEER will issue a Field Order directing the CONTRACTOR to cease all construction operations at the location of such potential cultural resources find.

2. Such Field Order shall be effective until such time as a qualified archaeologist can be called to assess the value of these potential cultural resources and make recommendations to the State Historic Preservation Office.

D. If the archaeologist determines that the potential find is a bona fide cultural resource, at the direction of the State Historic Preservation Office, the CONTRACTOR shall suspend work at the location of the find under the provisions for changes contained in Articles 10, 11, and 12 of the General Conditions.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

- END OF SECTION -

SECTION 01700 - PROJECT CLOSEOUT

PART 1 -- GENERAL

1.1 FINAL CLEANUP

A. The CONTRACTOR shall promptly remove from the vicinity of the completed WORK, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the WORK by the OWNER will be withheld until the CONTRACTOR has satisfactorily performed the final cleanup of the Site.

1.2 CLOSEOUT TIMETABLE

A. The CONTRACTOR shall establish dates for equipment testing, acceptance periods, and on-site instructional periods (as required under the Contract). Such dates shall be established not less than one week prior to beginning any of the foregoing items, to allow the OWNER, the ENGINEER, and their authorized representatives sufficient time to schedule attendance at such activities.

1.3 CONDITION OF SITE

CONTRACTOR shall leave site in a satisfactory condition, as approve by the ENGINEER. Return all work areas to its original condition. Grade areas that have been disturbed, replace gravel surfaces as necessary. Remove all debris, waste concrete, etc. Remove earth that has oil or grease that leaked from equipment.

1.4 FINAL SUBMITTALS

A. The CONTRACTOR, prior to requesting final payment, shall obtain and submit the following items to the ENGINEER for transmittal to the OWNER:

1. Written guarantees, where required.

2. Technical Manuals and instructions.

3. Maintenance stock items; spare parts; special tools.

4. Completed record drawings.

5. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.

1.5 MAINTENANCE AND GUARANTEE

A. The CONTRACTOR shall comply with the maintenance and guarantee requirements contained in the Contract Documents.

B. 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 OWNER from further responsibility in connection with such repair or resurfacing.

C. The CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order from the OWNER. If the CONTRACTOR fails to make such repairs or replacements promptly, the OWNER reserves the right to do the WORK and the CONTRACTOR and its surety shall be liable to the OWNER for the cost thereof.

1.6 BOND

A. The CONTRACTOR shall provide a bond to guarantee performance of the provisions contained in Paragraph "Maintenance and Guarantee" above, and the General Conditions.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

- END OF SECTION -

SECTION 02200 - EARTHWORK

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall perform all earthwork indicated and required for construction of the WORK, complete and in place, in accordance with the Contract Documents.

NOTE: Geotechnical investigations and recommendations were completed for the site, and are incorporated into the contract documents. The project geotechnical report will provide information regarding site soil conditions. The CONTRACTOR shall refer to recommendations of the geotechnical report for earthwork requirements. In the case of conflict, requirements of the geotechnical report shall supersede the requirements herein.

1.2 CONTRACTOR SUBMITTALS

A. The CONTRACTOR's attention is directed to 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 over shall submit to the OWNER and shall be in receipt of the OWNER's written acceptance of the CONTRACTOR's detailed plan showing design of all shoring, bracing, sloping 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 standards established in the Construction Safety Orders of the State of California, such alternative systems plans shall be prepared by a civil or structural engineer licensed in the State of California.

B. The CONTRACTOR shall submit samples of all materials proposed to be used in the work in accordance with the requirements in Section 01300 - Contractor Submittals. Sample sizes shall be as determined by the testing laboratory.

PART 2 -- PRODUCTS

2.1 SUITABLE FILL AND BACKFILL MATERIAL REQUIREMENTS

A. **General:** Fill, backfill, and embankment materials shall be suitable selected or processed clean, fine earth, rock, or sand, free from grass, roots, brush, or other vegetation.

B. Fill and backfill materials to be placed within 12 inches of any structure or pipe shall be free of rocks or unbroken masses of earth materials having a maximum dimension larger than 3 inches.

C. **Suitable Materials:** Materials not defined as unsuitable below are defined as suitable materials and may be used in fills, backfilling, and embankment construction subject to the indicated limitations. In addition, when acceptable to the ENGINEER, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a stable composite.

D. Suitable materials may be obtained from on-site excavations, may be processed on-site materials, or may be imported. If imported materials are required by this Section or to meet the quantity requirements of the project the CONTRACTOR shall provide the imported materials at no additional expense to the OWNER, unless a unit price item is included for imported materials in the bidding schedule.

E. The following types of suitable materials are defined:

1. Type A (three-quarters inch minus granular backfill): Crushed rock or gravel, and sand with the gradation requirements below. The material shall have a minimum sand equivalent value of 28 and a minimum R-value of 78. If the sand equivalent value exceeds 35 the R-value requirement is waived.

Sieve Size	Percentage Passing
3/4-inch	100
No. 4	30 - 50
No. 200	0 - 12

2. Type B (Class I crushed stone): Manufactured angular, crushed stone, crushed rock, or crushed slag with the following gradation requirements. The material shall have a minimum sand equivalent value of 75.

Sieve Size	Percentage Passing
3/4-inch	100
No. 4	30 - 50
No. 200	0 - 5

3. Type C (sand backfill): Sand with 100 percent passing a 3/8-inch sieve, at least 90 percent passing a Number 4 sieve, and a sand equivalent value not less than 30.

4. Type D: Not used

5. Type E (pea gravel backfill): Crushed rock or gravel the size gradation for Size Number 8 in ASTM C 33 – Concrete Aggregates.

6. Type F (coarse drainrock): Crushed rock or gravel with the size gradation for Size Number 4 in ASTM C 33

7. Type G (aggregate base): Crushed rock aggregate base material of such nature that it can be compacted readily by watering and rolling to form a firm, stable base for pavements. At the option of the CONTRACTOR, the grading for either the 1-1/2-inch maximum size or 3/4-inch maximum size gradation shall be used. The sand equivalent value shall be not less than 22, and the material shall meet the following gradation requirements:

	Percentage Passing	
Sieve Size	1-1/2-inch Max. Gradation	3/4-inch Max. Gradation
2-inch	100	-

1-1/2-inch	90 - 100	-
1-inch	-	100
3/4-inch	50 - 85	90 - 100
No. 4	25 - 45	35 - 55
No. 30	10 - 25	10 - 30
No. 200	2 - 9	2 - 9

8. Type H (graded drainrock): Drainrock shall be crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall meet the gradation requirements for Size Number 57 in ASTM C 33:

   The drainrock shall have a sand equivalent value not less than 75. The finish graded surface of the drainrock immediately beneath hydraulic structures shall be stabilized to provide a firm, smooth surface upon which to construct reinforced concrete floor slabs. The CONTRACTOR shall use, at its option, one of the asphalt types listed below:

	Type 1	Type 2	Type 3
Designation	SC-800	SC-250	RS-1
Spray Temperature (°F)	175-255	165-200	70-120
Coverage (gal/sq yd)	0.50	0.50	0.50

   If the surface remains tacky, sufficient sand shall be applied to absorb the excess asphalt.

9. Type I: Any other suitable material as defined herein.

10. Type J (cement-treated backfill): Material which consists of Type H material, or any mixture of Types B, C, G, and H materials which has been cement-treated so that the cement content of the material is not less than 5 percent by weight when tested in accordance with ASTM D 2901 - Standard Test Method for Cement Content of Freshly Mixed Soil Cement. The ultimate compressive strength at 28 days shall be not less than 400 psi when tested in accordance with ASTM D 1633 - Standard Test Method for Compressive Strength of Molded Soil - Cement Cylinders.

11. Type K (topsoil): Stockpiled topsoil material which has been obtained at the site by removing soil to a depth not exceeding 2 feet. Removal of the topsoil shall be done after the area has been stripped of vegetation and debris.

12. Not Used.

13. Type M (No. 2 aggregate subbase): Crushed rock aggregate subbase material that can be compacted readily by watering and rolling to form a firm stable base. The sand equivalent value shall be not less than 18 and the material shall meet the following gradation requirements:

Sieve Size	Percentage Passing
3-inch	100
2-1/2 inch	87 - 100
No. 4	35 - 95
No. 200	0 - 29

14. Type N (trench plug): Low permeable fill material, a non-dispersible clay material having a minimum plasticity index of 10.

2.2 UNSUITABLE MATERIAL

A. Unsuitable materials include the materials listed below.

1. Soils which, when classified under ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System), fall in the classifications of Pt, OH, CH, MH, or OL.

2. Soils which cannot be compacted sufficiently to achieve the density specified for the intended use.

3. Materials that contain hazardous or designated waste materials including petroleum hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.

4. Soils that contain greater concentrations of chloride or sulfate ions, or have a soil resistivity or pH less than the existing on-site soils.

5. Topsoil, except as allowed below.

2.3 USE OF FILL, BACKFILL, AND EMBANKMENT MATERIAL TYPES

A. The CONTRACTOR shall use the types of materials as designated herein for all required fill, backfill, and embankment construction hereunder.

B. Where these Specifications conflict with the requirements of any local agency having jurisdiction or with the requirements of a pipe material manufacturer, the ENGINEER shall be immediately notified. In case of conflict between types of pipe embedment backfills, the CONTRACTOR shall use the agency-specified backfill material if that material provides a greater degree of structural support to the pipe, as determined by the ENGINEER. In case of conflict between types of trench or final backfill types, the CONTRACTOR shall use the agency-specified backfill material if that material provides the greater in-place density after compaction.

C. Fill and backfill types shall be used in accordance with the following provisions:

1. Embankment fills shall be constructed of Type I material, as defined herein, or any mixture of Type I and Type A through Type H materials.

2. Pipe zone backfill, as defined under "Pipe and Utility Trench Backfill" below, shall consist of the following materials for each pipe material listed below.

a. Mortar coated pipe, concrete pipe, and un-coated ductile iron pipe shall be provided Type A or B pipe bedding and embedment backfill material.

b. Coal tar enamel coated pipe, polyethylene encased pipe, tape wrapped pipe, epoxy coated pipe, and other non-mortar coated pipe shall be backfilled with Type C bedding and embedment zone backfill material.

c. Plastic pipe and vitrified clay pipe shall be backfilled with Type B bedding and embedment zone backfill material. Vitrified clay pipe shall be backfilled with Type B material to the top of the pipe zone.

d. Where pipelines are installed on grades exceeding 4 percent, and where backfill materials are graded such that there is less than 10 percent passing a Number 4 sieve, trench plugs of Type J, L, or N material shall be provided at maximum intervals of 200 feet unless indicated otherwise.

3. Trench zone backfill for pipelines as defined under "Pipe and Utility Trench Backfill" shall be Type I backfill material or any of Types A through H backfill materials or any mixture thereof, except:

   a. Type K material may be used for trench zone backfill in agricultural areas unless otherwise shown or specified.

4. Final backfill material for pipelines under paved areas, as defined under "Pipe and Utility Trench Backfill" shall be Type G backfill material. Final backfill under areas not paved shall be the same material as that used for trench backfill, except that Type K material shall be used for final backfill in agricultural areas unless otherwise indicated.

5. Trench backfill and final backfill for pipelines under structures shall be the same material as used in the pipe zone, except where concrete encasement is required by the Contract Documents.

6. Aggregate base materials under pavements shall be Type G material constructed to the thicknesses indicated. Aggregate subbase shall be Type M material.

7. Backfill around structures shall be Type I material, or Types A through Type H materials, or any mixture thereof, except as shown.

8. Backfill materials beneath structures shall be as follows:

   a. Drainrock materials under hydraulic structures or other water retaining structures with underdrain systems shall be Type H material.

   b. Under concrete hydraulic structures or other water retaining structures without underdrain systems, Types G or H materials shall be used.

   c. Under structures where groundwater must be removed to allow placement of concrete, Type F material shall be used. Before the Type F material is placed, filter fabric shall be placed over the exposed foundation.

   d. Under all other structures, Type G or H material shall be used.

9. Backfill used to replace pipeline trench over-excavation shall be a layer of Type F material with a 6-inch top filter layer of Type E material or filter fabric to prevent migration of fines for wet trench conditions or the same material as used for the pipe zone backfill if the trench conditions are not wet.

10. The top 6 inches of fill on reservoir roofs, embankment fills around hydraulic structures, and all other embankment fills shall consist of Type K material, topsoil.

11. Filter fabric shall be **Mirafi 140 N, Mirafi 700X,** or equal.

2.4 MATERIALS TESTING

A. All soils testing of samples submitted by the CONTRACTOR will be done by a testing laboratory of the OWNER'S choice and at the OWNER'S expense. At its discretion, the ENGINEER may request that the CONTRACTOR supply samples for testing of any material used in the work.

B. Particle size analysis of soils and aggregates will be performed using ASTM D 422 - Standard Test Method for Particle-Size Analysis of Soils.

C. Determination of sand equivalent value will be performed using ASTM D 2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

D. **Unified Soil Classification System:** References in this Section to soil classification types and standards shall have the meanings and definitions indicated in ASTM D 2487. The CONTRACTOR shall be bound by all applicable provisions of said ASTM D 2487 in the interpretation of soil classifications.

PART 3 -- EXECUTION

3.1 EXCAVATION - GENERAL

A. **General:** Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the WORK. The removal of said materials shall conform to the lines and grades indicated or ordered. Unless otherwise indicated, the entire construction site shall be stripped of all vegetation and debris, and such material shall be removed from the site prior to performing any excavation or placing any fill. The CONTRACTOR shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926).

B. Removal and Exclusion of Water: The CONTRACTOR shall remove and exclude water, including stormwater, groundwater, irrigation water, and wastewater, from all excavations. Dewatering wells, wellpoints, sump pumps, or other means shall be used to remove water and continuously maintain groundwater at a level at least two feet below the bottom of excavations before the excavation work begins at each location. Water shall be removed and excluded until backfilling is complete and all field soils testing has been completed.

3.2 STRUCTURE, ROADWAY, AND EMBANKMENT EXCAVATION

A. **Excavation Beneath Structures and Embankments:** Except where otherwise indicated for a particular structure or ordered by the ENGINEER, excavation shall be carried to the grade of the bottom of the footing or slab. Where indicated or ordered, areas beneath structures or fills shall be over-excavated. The subgrade areas beneath embankments shall be excavated to remove not less than the top 6 inches of native material and where such subgrade is sloped, the native material shall be benched. When such over-

excavation is indicated, both over-excavation and subsequent backfill to the required grade shall be performed by the CONTRACTOR. When such over-excavation is not indicated but is ordered by the ENGINEER, such over-excavation and any resulting backfill will be paid for under a separate unit price bid item if such bid item has been established; otherwise payment will be made in accordance with a negotiated price. After the required excavation or over-excavation has been completed, the exposed surface shall be scarified to a depth of 6 inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 95 percent of maximum density.

B. **Excavation Beneath Concrete Reservoirs:** Excavation under reservoirs shall extend to the bottom of the drainrock layer. After such excavation has been completed, the exposed surface shall be rolled with heavy compaction equipment to 95 percent of maximum density and then graded to provide a reasonably smooth surface for placement of the drainrock. Areas under the reservoir upon which fill is to be placed shall be scarified to a depth of 6 inches, brought to optimum moisture content, and compacted to obtain 95 percent of maximum density.

C. **Excavation Beneath Paved Areas:** Excavation under areas to be paved shall extend to the bottom of the aggregate base or subbase, if such base is called for; otherwise it shall extend to the paving thickness. After the required excavation has been completed, the top 12 inches of exposed surface shall be scarified, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 95 percent of maximum density. The finished subgrade shall be even, self-draining, and in conformance with the slope of the finished pavement. Areas that could accumulate standing water shall be regraded to provide a self-draining subgrade.

D. **Notification of ENGINEER:** The CONTRACTOR shall notify the ENGINEER at least 3 days in advance of completion of any structure excavation and shall allow the ENGINEER a review period of at least one day before the exposed foundation is scarified and compacted or is covered with backfill or with any construction materials.

3.3 PIPELINE AND UTILITY TRENCH EXCAVATION

A. Exploratory Excavation

1. The CONTRACTOR shall excavate and expose buried points of connection to existing utilities and all known potential conflicts. Excavation shall be performed prior to any work and preparation of Shop Drawings for connections and before fabrication of pipe, and the data obtained shall be used in preparing Shop Drawings. No payments for mobilization will be made to CONTRACTOR without completion of potholing activities.

2. Data, including dates, locations excavated, and sketches, shall be submitted to the ENGINEER within one week of excavation.

3. Damage to utilities from excavation activities shall be repaired by the CONTRACTOR.

B. **General:** Unless otherwise indicated or ordered, excavation for pipelines and utilities shall be open-cut trenches with widths as indicated in the Owner's standard construction specifications.

C. **Trench Bottom:** Except when pipe bedding is required, the bottom of the trench shall be

excavated uniformly to the grade of the bottom of the pipe bedding. Excavations for pipe bells and welding shall be made as required.

D. **Open Trench:** The maximum amount of open trench permitted in any one location shall be 300 feet, or the length necessary to accommodate the amount of pipe installed in a single day, whichever is greater. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel plate will be waived in cases where the trench is located further than 100 feet from any traveled roadway or occupied structure. In such cases, however, barricades and warning lights meeting safety requirements shall be provided and maintained.

E. **Trench Over-Excavation:** Where trenches are indicated to be over-excavated, excavation shall be to the depth indicated, and backfill shall be installed to the grade of the bottom of the pipe bedding.

F. **Over-Excavation:** When ordered by the ENGINEER, whether indicated on the Drawings or not, trenches shall be over-excavated beyond the depth and/or width shown. Such over-excavation shall be to the dimensions ordered. The trench shall then be backfilled to the grade of the bottom of the pipe bedding. Over-excavation less than 6 inches below the limits on the Drawings shall be done at no increase in cost to the OWNER. When the over-excavation ordered by the ENGINEER is 6 inches or greater below the limits shown, or wider, additional payment will be made to the CONTRACTOR. Said additional payment will be made under separate unit price bid items for over-excavation if such bid items have been established; otherwise payment will be made in accordance with a negotiated price.

G. Where pipelines are to be installed in embankments, fills, or structure backfills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.

H. If a moveable trench shield is used during excavation operations, the trench width shall be wider than the shield so that the shield is free to be lifted and then moved horizontally without binding against the trench sidewalls. If the trench walls cave in or slough, the trench shall be excavated as an open excavation with sloped sidewalls or with trench shoring, as indicated and as required by the pipe structural design.

3.4 OVER-EXCAVATION NOT ORDERED OR INDICATED

A. Any over-excavation carried below the grade ordered or indicated, shall be backfilled and compacted to the required grade with the indicated material.

3.5 EXCAVATION IN LAWN AREAS

A. Where excavation occurs in lawn areas, the sod shall be carefully removed, dampened, and stockpiled to preserve it for replacement. Excavated material may be placed on the lawn; provided, that a drop cloth or other suitable method is employed to protect the lawn from damage. The lawn shall not remain covered for more than 72 hours. Immediately after completion of backfilling [and testing of the pipeline], the sod shall be replaced and lightly rolled in a manner so as to restore the lawn as near as possible to its original condition. CONTRACTOR shall provide new sod if stockpiled sod has not been replaced within 72 hours.

3.6 EXCAVATION IN VICINITY OF TREES

A. Except where trees are indicated to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission of the ENGINEER. Trees shall be supported during excavation by any means previously reviewed by the ENGINEER.

3.7 Not Used

3.8 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. The CONTRACTOR shall remove and dispose of all excess excavated material at a site selected by the CONTRACTOR and reviewed by the ENGINEER.

3.9 BACKFILL – GENERAL

A. All backfill shall be installed in accordance with the requirements herein, or as defined in the geotechnical report for the project site, as referenced elsewhere in the contract documents. The site geotechnical report recommendations shall be used if and when conflicts occur between this section and the report regarding material, compaction, or placement requirements.

B. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed. Backfill around water retaining structures shall not be placed until the structures have been tested, and the structures shall be full of water while backfill is being placed.

C. Except for drainrock materials being placed in over-excavated areas or trenches, backfill shall be placed after all water is removed from the excavation, and the trench sidewalls and bottom have been dried to a moisture content suitable for compaction.

D. If a moveable trench shield is used during excavation, pipe installation, and backfill operations, the shield shall be moved by lifting the shield free of the trench bottom or backfill and then moving the shield horizontally, The CONTRACTOR shall not drag trench shields along the trench causing damage or displacement to the trench sidewalls, the pipe, or the bedding and backfill.

E. Immediately prior to placement of backfill materials, the bottoms and sidewalls of trenches and structure excavations shall have all loose sloughing, or caving soil and rock materials removed. Trench sidewalls shall consist of excavated surfaces that are in a relatively undisturbed condition before placement of backfill materials.

3.10 PLACING AND SPREADING OF BACKFILL MATERIALS

A. Backfill materials shall be placed and spread evenly in layers. When compaction is achieved using mechanical equipment, the layers shall be evenly spread so that when compacted each layer shall not exceed 6 inches in thickness.

B. No flooding or jetting is allowed.

C. During spreading, each layer shall be thoroughly mixed as necessary to promote

uniformity of material in each layer. Pipe zone backfill materials shall be manually spread around the pipe so that when compacted the pipe zone backfill will provide uniform bearing and side support.

D. Where the backfill material moisture content is below the optimum moisture content, water shall be added before or during spreading until the proper moisture content is achieved.

E. Where the backfill material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory.

3.11 COMPACTION OF FILL, BACKFILL, AND EMBANKMENT MATERIALS

A. Each layer of Types A, B, C, G, H, I, and K backfill materials as defined herein, where the material is graded such that 10 percent or more passes a No. 4 sieve, shall be mechanically compacted to the indicated percentage of density. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content.

B. Each layer of Type E, F, and J backfill materials shall be compacted by means of at least 2 passes from a flat plate vibratory compactor. When such materials are used for pipe zone backfill, vibratory compaction shall be used at the top of the pipe zone or at vertical intervals of 24 inches, whichever is the least distance from the subgrade.

C. Fill on reservoir and structure roofs shall be deposited at least 30 days after the concrete roof slab has been placed. Equipment weighing more than 10,000 pounds when loaded shall not be used on a roof. A roller weighing not more than 8,000 pounds shall be used to compact fill on a roof.

D. Flooding, ponding, or jetting shall not be used.

E. Pipe zone backfill materials that are granular, may be compacted by a combination of manual compaction, vibration, rolling, and pressure plates.

F. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the depth of the fill at that time. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.

G. Backfill around and over pipelines that is mechanically compacted shall be compacted using light, hand operated, vibratory compactors and rollers. After completion of at least two feet of compacted backfill over the top of pipeline, compaction equipment weighing no more than 8,000 pounds may be used to complete the trench backfill.

G. **Compaction Requirements:** The following compaction test requirements shall be in accordance with ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soils Using Modified Effort (56,000 ft - lbf/ft^3) (2,700 kN-m/m^3) for Type A, B, C, G, H, I, K, M, and N materials and in accordance with ASTM D 4253 - Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table, and D 4254 - Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density, for Type B, E, F, and J materials. Where agency or utility company requirements govern, the highest compaction standards shall apply.

Location or Use of Fill	Percentage of Maximum Density	Percentage of Relative Density
Pipe embedment backfill for flexible pipe.	95	70
Pipe bedding and over-excavated zones under bedding for flexible pipe, including trench plugs.	90	70
Pipe embedment backfill for Steel Yard Piping	90	70
Pipe embedment backfill for rigid pipe	90	55
Pipe zone backfill portion above embedment for rigid pipe.	95	70
Pipe bedding and over-excavated zones under bedding for rigid pipe.	90	70
Final backfill, beneath paved areas or structures.	95	70
Final backfill, not beneath paved areas or structures.	90	55
Trench zone backfill, beneath paved areas and structures, including trench plugs.	95	70
Trench zone backfill, not beneath paved areas or structures, including trench plugs.	95	70
Embankments and fills.	90	55
Embankments and fills beneath paved areas or structures.	95	70
Backfill beneath structures and hydraulic structures.	95	70
Backfill and fill around structures on reservoir or structure roof.	90	55
Topsoil (Type K material)	80	N.A.
Aggregate base or subbase (Type G or M material)	95	N.A.

3.12 PIPE AND UTILITY TRENCH BACKFILL

A. Pipe Zone Backfill

1. The pipe zone is defined as that portion of the vertical trench cross-section lying between a plane below the bottom surface of the pipe and a plane at a point above the top surface of the pipe as indicated. The bedding is defined as that portion of pipe zone backfill material between the trench subgrade and the bottom of the pipe. The embedment is defined as that portion of the pipe zone backfill material between the bedding and a level line as indicated.

2. After compacting the bedding the CONTRACTOR shall perform a final trim using a stringline for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe. Excavation for pipe bells and welding shall be made as required.

3. The pipe zone shall be backfilled with the indicated backfill material. The CONTRACTOR shall exercise care to prevent damage to the pipeline coating, cathodic bonds, and the pipe itself during the installation and backfill operations.

4. If a moveable trench shield is used during backfill operations the shield shall be lifted to a location above each layer of backfill material prior to compaction of the layer. The CONTRACTOR shall not displace the pipe or backfill while the shield is being moved.

B. **Trench Zone Backfill:** After the pipe zone backfills have been placed, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the vertical trench cross-section lying as indicated between a plane above the top surface of the pipe and a plane at a point 18 inches below the finished surface grade, or if the trench is under pavement, 18 inches below the roadway subgrade.

C. **Final Backfill:** Final backfill is all backfill in the trench cross-sectional area within 18 inches of finished grade, or if the trench is under pavement, all backfill within 18 inches of the roadway subgrade.

3.13 FILL AND EMBANKMENT CONSTRUCTION

A. The area where a fill or embankment is to be constructed shall be cleared of all vegetation, roots and foreign material. Following this, the surface shall be moistened, scarified to a depth of 6 inches, and rolled or otherwise mechanically compacted. Embankment and fill material shall be placed and spread evenly in approximately horizontal layers. Each layer shall be moistened or aerated, as necessary. Unless otherwise approved by the ENGINEER, each layer shall not exceed 6 inches of compacted thickness. The embankment, fill, and the scarified layer of underlying ground shall be compacted to 95 percent of maximum density under structures and paved areas, and 90 percent of maximum density elsewhere.

B. When an embankment or fill is to be made and compacted against hillsides or fill slopes steeper than 4:1, the slopes of hillsides or fills shall be horizontally benched to key the embankment or fill to the underlying ground. A minimum of 12 inches normal to the slope of the hillside or fill shall be removed and re-compacted as the embankment or fill is brought up in layers. Material thus cut shall be re-compacted along with the new material. Hillside or fill slopes 4:1 or flatter shall be prepared in accordance with Paragraph A, above.

C. Where embankment or structure fills are constructed over pipelines, the first 4 feet of fill over the pipe shall be constructed using light placement and compaction equipment that does not damage the pipe. Heavy construction equipment shall maintain a minimum distance from the edge of the trench equal to the depth of the trench until at least 4 feet of fill over the pipe has been completed.

3.14 FIELD TESTING

A. **General:** All field soils testing will be done by a testing laboratory of the OWNER's choice at the OWNER's expense except as indicated below.

B. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with Method C of ASTM D 1557. Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method, ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place By Nuclear Methods (Shallow Depth), or by such other means acceptable to the ENGINEER.

C. In case the test of the fill or backfill show non-compliance with the required density, the CONTRACTOR shall accomplish such remedy as may be required to insure compliance. Subsequent testing to show compliance shall be by a testing laboratory selected by the OWNER and paid by the CONTRACTOR.

D. The CONTRACTOR shall provide test trenches and excavations including excavation, trench support, and groundwater removal for the OWNER'S field soils testing operations. The trenches and excavations shall be provided at the locations and to the depths required by the OWNER.

- END OF SECTION -

SECTION 02565 - DUCTILE IRON PIPE (AWWA C151, MODIFIED)

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide ductile iron pipe and all appurtenant work, complete in place, in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. **Commercial Standards:**

ANSI/AWWA C104/A21.4	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
ANSI/AWWA C105/A21.5	Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
ANSI/AWWA C110/A21.10	Ductile-Iron and Gray-Iron Fittings, 3 in Through 48 in for Water and Other Liquids
ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
ANSI/AWWA C115/A21.15	Flanged Ductile-Iron and Gray-Iron Pipe with Threaded Flanges
ANSI/AWWA C150/A21.50	Thickness Design of Ductile-Iron Pipe
ANSI/AWWA C151/A21.51	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
ANSI/AWWA C153/A21.53	Ductile-Iron Compact Fittings, 3 in. Through 12 in. for Water and Other Liquids
AWWA C209	Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
AWWA C214	Tape Coating Systems for the Exterior of Steel Water Pipelines
AWWA C600	Installation of Ductile Iron Water Mains and Their Appurtenances
ASTM C 150	Specification for Portland Cement

1.3 CONTRACTOR SUBMITTALS

A. **Shop Drawings:** The CONTRACTOR shall submit shop drawings of pipe and fittings in acc

ordance with the requirements in Section 01300 - Contractor Submittals, the requirements of the referenced standards and the following supplemental requirements as applicable:

1. Certified dimensional drawings of all valves, fittings, and appurtenances.

2. For pipe 24 inches in diameter and larger, line layout and marking diagrams which indicate the specific number of each fitting and the location and the direction of each fitting in the completed line. In addition, the line layouts shall include: the pipe station and invert elevation at all changes in grade or horizontal alignment; all elements of curves and bends, both in horizontal and vertical alignment; and the limits of each reach of restrained joints, or of concrete encasement.

B. **Certifications:** The CONTRACTOR shall furnish a certified affidavit of compliance for all pipe and other products or materials furnished under this Section of the Specifications, as specified in the referenced standards and the following supplemental requirements:

1. Physical and chemical properties.

2. Hydrostatic test reports.

C. The CONTRACTOR shall be responsible for performing and paying for sampling and testing as necessary for the certifications.

1.4 QUALITY ASSURANCE

A. **Inspection:** All pipe shall be subject to inspection at the place of manufacture in accordance with the provisions of the referenced standards, as supplemented by the requirements herein. The CONTRACTOR shall notify the ENGINEER in writing of the manufacturing starting date not less than 14 calendar days prior to the start of any phase of the pipe manufacture.

B. During the manufacture of the pipe, the ENGINEER shall be given access to all areas where manufacturing is in process and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.

C. **Tests:** Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with the requirements of the referenced standards as applicable.

D. The CONTRACTOR shall perform said material tests at no additional cost to the OWNER. The ENGINEER shall have the right to witness all testing conducted by the CONTRACTOR; provided, that the CONTRACTOR's schedule is not delayed for the convenience of the ENGINEER.

E. In addition to those tests specifically required, the ENGINEER may request additional samples of any material including lining and coating samples for testing by the OWNER. The additional samples shall be furnished as a part of the WORK.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Mortar-lined and polyethylene-wrapped or tape-coated ductile iron pipe shall conform to ANSI/AWWA C151, C104, and C105, or C151 and C214, subject to the following supplemental requirements. The pipe shall be of the diameter and class shown, shall be furnished complete with rubber gaskets as indicated in the Contract Documents, and all specials and fittings shall be provided as required under the Contract Documents.

B. **Markings:** The CONTRACTOR shall legibly mark specials 24 inches in diameter and larger in accordance with the laying schedule and marking diagram. All fittings shall be marked at each end with top field centerline.

C. **Handling and Storage:** The pipe shall be handled by devices acceptable to the ENGINEER, designed and constructed to prevent damage to the pipe coating/exterior. The use of equipment which might injure the pipe coating/exterior will not be permitted. Stockpiled pipe shall be suitably supported and shall be secured to prevent accidental rolling. All other pipe handling equipment and methods shall be acceptable to the ENGINEER.

D. Tape-coated pipe shall have the following additional requirements:

1. It shall be the responsibility of the manufacturer of tape-coated ductile iron pipe to prevent damage of the coating which might be caused by handling and/or storage of the completed pipe at low temperature.

E. **Laying Lengths:** Maximum pipe laying lengths shall be 20 ft with shorter lengths provided as required by the Drawings.

F. **Finish:** The pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing and roughness.

G. **Bonding and Electrical Conductivity:** All pipe joints shall be prepared for bonding for electrical conductivity in accordance with the details shown. The CONTRACTOR shall furnish all materials required for joint bonding and electrolysis test station installations.

H. **Closures and Correction Pieces:** Closures and correction pieces shall be provided as required so that closures may be made due to different headings in the pipe laying operation and so that correction may be made to adjust the pipe laying to conform to pipe stationing shown on the Drawings. The locations of correction pieces and closure assemblies are shown on the Drawings. Any change in location or number of said items shall be acceptable to the ENGINEER.

2.2 PIPE DESIGN CRITERIA

A. **General:** Ductile iron pipe shall be designed in accordance with the requirements of ANSI/AWWA C150 as applicable and as modified in this Section.

B. **Pipe Wall Thickness for Internal Pressure:** The pipe shall be designed with a net thickness to withstand the design pressure in accordance with the hoop stress formula.

C. **Pipe Wall Thickness for External Load:** The pipe shall also be designed with a net thickness to withstand external loads using ANSI/AWWA C150 Design Equation (2) with the appropriate bending moment and deflection coefficients for Laying Condition Types 4 and

5 as applicable.

D. The pipe deflection shall be checked using ANSI/AWWA C150 Design Equation (3) and the coefficients stated above. The allowable deflection shall not exceed 0.0225 times the nominal diameter.

E. In lieu of ANSI/AWWA C150 Design Equation (4), the earth loads will be computed using the following 2 equations for trench or embankment loading as applicable:

1. Trench Condition:

$$W_d = C_d w B_d^2$$

Where:
- W_d = Earth Load in pounds per linear foot
- C_d = Calculation Coefficient
- Ku' = [0.13]
- w = [120] lb/ft^3
- B_d = Trench width at top of pipe, feet

2. Positive Projecting Embankment Condition:

$$W_c = C_c w B_c^2$$

Where:
- W_c = Earth Load in pounds per linear foot
- C_c = Calculation Coefficient (based on $r_{sd}P$ of 0.25)
- Ku = [0.19]
- w = [120] lb/ft^3
- B_c = Outside diameter of pipe, feet

F. The above 2 formulas are based on a depth of cover of 10 feet or greater. For depths of cover of less than 10 feet, HS-20 live load shall be included. For depths of cover of 3 feet or less, HS-20 live load plus impact shall be included. The determination of live load and impact factors shall be as recommended by AASHTO in "Standard Specifications for Highway Bridges."

G. If the calculated deflection, $Defl_x$, exceeds 0.0225 times the nominal diameter, the pipe class shall be increased.

H. **Minimum Pipe Wall Thickness:** In addition to the requirements of this Section, the minimum wall thickness shall be in accordance with Table 50.5 of ANSI/AWWA C150.

2.3 MATERIALS

A. **Ductile Iron Pipe:** Pipe materials shall conform to the requirements of ANSI/AWWA C151.

B. **Cement:** Cement for mortar lining shall conform to the requirements of ANSI/AWWA C104; provided, that cement for mortar lining shall be Type II or V. Cement shall not originate from kilns which burn metal-rich hazardous waste fuel, nor shall a fly ash or pozzolan be used as a cement replacement.

C. **Polyethylene Sleeve:** Material for the polyethylene sleeve shall conform to the req

uirements of ANSI/AWWA C105.

D. **Prefabricated Multi-layer Cold-Applied Tape Coating:** Except as described below, the coating system for straight line pipe shall be in accordance with AWWA C214. The system shall consist of at least four layers consisting of the following:

1. primer layer

2. inner layer tape - corrosion protective tape (20 mils)

3. outer layer tape - mechanical protective tape (30 mils) with white exterior

4. outer layer tape - mechanical protective tape (30 mils) with white exterior

The total thickness of the tape coating shall be at least 80 mils.

2.4 SPECIALS AND FITTINGS

A. Fittings for ductile iron pipe shall conform to the requirements of ANSI/AWWA C153/A21.53 or ANSI/AWWA C110/A21.10 for diameters 3-inch through 48-inch and shall have a minimum pressure rating of 250 psi. Ductile iron fittings larger than 48-inch shall conform to the above referenced standard with the necessary modifications for the larger size.

2.5 DESIGN OF PIPE

A. **General:** The pipe furnished shall be ductile iron pipe, mortar-lined and polyethylene-wrapped with rubber-gasketed joints as shown, unless otherwise stated.

B. The pipe shall be designed, manufactured, tested, inspected, and marked according to applicable requirements previously stated and except as hereinafter modified, shall conform to ANSI/AWWA C151.

C. **Pipe Dimensions:** The pipe shall be of the diameter and class shown. The minimum wall thickness for each pipe size shall be as specified or shown.

D. **Fitting Dimensions:** The fittings shall be of the diameter and class shown.

E. **Joint Design:** Ductile iron pipe and fittings shall be furnished with mechanical joints, push-on joints, flanged joints, and restrained joints as required.

1. Mechanical and push-on joints shall conform to ANSI/AWWA C111/A21.11.

2. Flanged joints shall conform to ANSI/AWWA C115/A21.15.

3. Restrained joints shall be mechanically restrained. Thrust blocks are not allowed.

F. For bell-and-spigot ends with rubber gaskets, the clearance between the bells and spigots shall be such that when combined with the gasket groove configuration and the gasket itself, will provide watertight joints under all operating conditions when properly installed. The CONTRACTOR shall require the pipe manufacturer to submit details complete with significant dimensions and tolerances and also to submit performance data indicating that the p

roposed joint has performed satisfactorily under similar conditions. In the absence of a history of field performance, the results of a test program shall be submitted.

G. Shop-applied interior linings and exterior coatings shall be held back from the ends of the pipe as shown or as otherwise acceptable to the ENGINEER.

2.6 CEMENT-MORTAR LINING

A. **Cement-Mortar Lining for Shop Application:** Except as otherwise provided herein, interior surfaces of all ductile iron pipe, fittings, and specials shall be cleaned and lined in the shop with cement-mortar lining applied centrifugally in conformity with ANSI/AWWA C104. During the lining operation and thereafter, the pipe shall be maintained in a round condition by suitable bracing or strutting. 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.

B. The minimum lining thickness shall be as follows:

Nominal Pipe Diameter (in)	Minimum Lining Thickness (in)
3-12	1/8
14-24	3/16
30-54	1/4

C. **Protection of Pipe Lining/Interior:** All shop-applied cement mortar lining shall be given a seal coat of asphaltic material in conformance with ANSI/AWWA C104.

2.7 EXTERIOR COATING OF PIPE

A. **Exterior Coating of Buried Piping:** The exterior coating shall be an asphaltic coating approximately 1 mil thick. All buried pipe shall be polywrap encased, per section 3.3.

B. **Exterior/Interior Transition:** Pipe sections transitioning from buried to exposed (i.e. at concrete wall penetrations) shall be cold-applied tape coated, per section 3.4, within 3 feet of wall on buried side, and extend 6” past penetration on interior side.

PART 3 -- EXECUTION

3.1 INSTALLATION OF PIPE

A. **Handling and Storage:** All pipe, fittings, etc., shall be carefully handled and protected against damage, impact shocks, and free fall. All pipe handling equipment shall be acceptable to the ENGINEER. Pipe shall not be placed directly on rough ground but shall be supported in a manner which will protect the pipe against injury whenever stored at the trench site or elsewhere. No pipe shall be installed where the lining or coating show defects that may be harmful as determined by the ENGINEER. Such damaged lining or coating shall be repaired, or a new undamaged pipe shall be furnished and installed.

B. All pipe damaged prior to Substantial Completion shall be repaired or replaced by the CON

TRACTOR.

C. The CONTRACTOR shall inspect each pipe and fitting prior to installation to insure that there are no damaged portions of the pipe.

D. Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance, which may have collected thereon and shall be kept clean at all times thereafter. For this purpose, the openings of all pipes and fittings in the trench shall be closed during any interruption to the WORK.

E. **Pipe Laying:** The pipe shall be installed in accordance with ANSI/AWWA C600.

F. Pipe shall be laid directly on the bedding material. No blocking will be permitted, and the bedding shall be such that it forms a continuous, solid bearing for the full length of the pipe. Excavations shall be made as needed to facilitate removal of handling devices after the pipe is laid. Bell holes shall be formed at the ends of the pipe to prevent point loading at the bells or couplings. Excavation shall be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coating on field joints.

G. Each section of pipe 24 inches in diameter and larger shall be laid in the order and position shown on the laying schedule. In laying pipe, it shall be laid to the set line and grade, within approximately one inch plus or minus. On grades of zero slope, the intent is to lay to grade.

H. Where necessary to raise or lower the pipe due to unforeseen obstructions or other causes, the ENGINEER may change the alignment and/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 recommended by the pipe manufacturer. No joint shall be misfit any amount which will be detrimental to the strength and water tightness of the finished joint.

I. Except for short runs which may be permitted by the ENGINEER, pipes shall be laid uphill on grades exceeding 10 percent. Pipe which 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.

J. **Cold Weather Protection:** No pipe shall be installed upon a foundation into which frost has penetrated or at any time that there is a danger of the formation of ice or penetration of frost at the bottom of the excavation. No pipe shall be laid unless it can be established that the trench will be backfilled before the formation of ice and frost occurs.

K. **Pipe and Specials Protection:** The openings of all pipe and specials shall be protected with suitable bulkheads to prevent unauthorized access by persons, animals, water or any undesirable substance. At all times, means shall be provided to prevent the pipe from floating.

L. **Pipe Cleanup:** As pipe laying progresses, the CONTRACTOR shall keep the pipe interior free of all debris. The CONTRACTOR shall completely clean the interior of the pipe of all sand, dirt, mortar splatter and any other debris following completion of pipe laying, pointing of joints and any necessary interior repairs prior to testing and disinfecting the completed pipeline.

3.2 RUBBER GASKETED JOINTS

A. **Rubber Gasketed Joints:** Immediately before jointing pipe, the bell end of the pipe shall be thoroughly cleaned, and a clean rubber gasket lubricated with an approved vegetable-based lubricant shall be placed in the bell groove. The spigot end of the pipe shall be carefully cleaned and lubricated with a vegetable-based lubricant. The spigot end of the pipe section shall then be inserted into the bell of the previously laid joint and telescoped into its proper position. Tilting of the pipe to insert the spigot into the bell will not be permitted.

3.3 POLYETHYLENE SLEEVE UNBONDED COATING

A. Buried ductile iron pipe shall be polyethylene encased in accordance with the requirements of ANSI/AWWA C105/A21.5.

3.4 BONDED TAPE COATING

A. **General:** The exterior joint recesses shall be thoroughly wiped clean and all water, loose scale, dirt, and other foreign material shall be removed from the surface of the pipe.

B. **Joint Coating of Tape-Coated Pipe:** Joints for tape-coated pipe shall be primed and wrapped with 2 thicknesses of 6-inch wide elastomeric joint tape, Type II per ANSI/AWWA C209. The total thickness of the tape wrap shall be at least 70 mils and shall be installed free of wrinkles with all laps bonded. All primer and joint tape shall be compatible with the line pipe coating.

C. All tape-coated joints will be tested by the ENGINEER with an electrical flaw detector capable of at least a 12,000 volt output, furnished by the CONTRACTOR. The tests shall be made using a voltage of 6,000 to 7,000 volts. Any holidays found shall be repaired by the CONTRACTOR at no expense to the OWNER.

D. **Coating Repair:** Coating repair shall be made using tape and primer conforming to ANSI/AWWA C209. When visual inspection shows a portion of the tape-wrap system has sustained physical damage, the damaged area shall be subjected to an electrical holiday test of 6,000 to 7,000 volts.

E. Following repair of the damaged area if the holiday test indicates a holiday still exists, the inner wrap shall be exposed and the exposed area shall be wiped clean with xylol solvent, or equal, and the area coated with tape primer. A patch of 35-mil thick cold-applied tape of sufficient size to cover the damaged area, plus a minimum lap of 2 inches in all directions, shall then be applied. The patched area shall again be tested for holidays. If none are detected, a second layer of 35-mil thick tape shall then be applied over the first patch. The second layer of tape shall overlap the first layer a minimum of 2 inches in all directions.

F. When the area tests showing no holiday, a notation shall be applied to the area indicating the test is satisfactory.

G. **Coating of Fittings and Specials:** Fittings and specials shall be coated in accordance with ANSI/AWWA C209. Prefabricated tape shall be Type II and shall be completely compatible with the tape system used for straight line pipe. The system shall consist of thr

ee layers consisting of the following:

1. primer layer

2. inner layer tape - corrosion protective tape (35 mils)

3. outer layer tape - corrosion protective tape (35 mils)

The total thickness of the tape coating shall be at least 70 mils.

3.5 INSTALLATION OF PIPE APPURTENANCES

A. **Protection of Appurtenances:** Where the joining pipe is tape-coated, buried appurtenances shall be coated with cold-applied tape in accordance with ANSI/AWWA C209, Type II. Where pipe is encased in polyethylene sleeves, buried appurtenances shall also be encased in polyethylene.

B. **Installation of Valves:** All valves 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. The CONTRACTOR shall adjust all stem packing and operate each valve prior to installation to insure proper operation.

C. All valves shall be installed so that the valve stems are plumb and in the location shown.

3.6 CORROSION CONTROL

A. **Joint Bonding/Electrolysis Test Stations:** Except where otherwise specified, all joints shall be bonded in accordance with the details shown. The pipe shall be cleaned to bare bright metal at the point where the bond is installed. In addition, electrolysis test stations shall be installed where shown.

- END OF SECTION -

SECTION 02589 - ABS AND PVC COMPOSITE PIPE
(ASTM D 2680, MODIFIED)

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide all acrylonitrile-butadiene-styrene (ABS) and polyvinyl chloride (PVC) composite pipe gravity sewers, and all appurtenant work, complete, all in accordance with the Contract Documents.

B. The pipe shall consist of two concentric extruded thermoplastic tubes integrally braced across the annulus. The resultant annular space shall be filled with inert material such as light-weight Portland cement concrete to provide continuous support between the inner and outer tubes.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards:

ASTM D 2564	Solvent Cement for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
ASTM D 2680	Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping

1.3 CONTRACTOR SUBMITTALS

A. **Shop Drawings:** The CONTRACTOR shall submit shop drawings of pipe, fittings, and appurtenances in accordance with the requirements of Section 01300, "Contractor Submittals."

B. **Certificates:** The CONTRACTOR shall provide manufacturer's certification that pipe has been tested for stiffness and deflection in accordance with ASTM D 2680, and that the test results comply with the Specification requirements.

1.4 QUALITY ASSURANCE

A. **Mandrel Test:** All ABS and PVC composite gravity sewer pipe shall be tested for deflection and obstructions. The mandrel test shall be performed after backfilling and compacting but prior to final paving and prior to leakage testing.

B. A rigid mandrel, with a circular cross section having a diameter at least 95 percent of the specified average inside diameter, shall be pulled through the pipe by hand. The minimum length of the circular portion of the mandrel shall be equal to the nominal diameter of the pipe. If the mandrel sticks in the pipe at any point the pipe shall be repaired and retested.

PART 2 -- PRODUCTS

2.1 GENERAL

A. All ABS and PVC composite pipe shall be continuously and permanently marked with the manufacturer's name, pipe size, ASTM Specification Number, type of plastic, and extrusion code, including date and location of manufacture.

2.2 PIPE AND FITTINGS

A. All ABS and PVC composite pipe and fittings shall conform to the requirements of ASTM Designation D 2680, and shall have either solvent cement joints or elastomeric gasket joints.

2.3 SOLVENT CEMENT JOINTS

A. Primer for ABS and PVC solvent cement joints shall be MEK (methyl ethyl ketone).

B. Cement for ABS joints shall be MEK containing a minimum of 20 percent by weight of dissolved ABS and shall comply with ASTM D 2680.

C. Cement for PVC joints shall comply with ASTM D 2564 except that the minimum resin content shall be 16 percent and minimum viscosity shall be 3500 cP.

2.4 ELASTOMERIC GASKET JOINTS

A. Pipe with gasketed joints shall be manufactured with a socket configuration which will prevent improper installation of the gasket and will ensure that the gasket remains in place during the joining operation. The gasket shall be manufactured from a synthetic elastomer containing not less than 50 percent by volume of first-grade synthetic rubber.

PART 3 -- EXECUTION

3.1 GENERAL

A. All laying, jointing, testing for defects and for leakage shall be performed in the presence of the ENGINEER, and shall be subject to its approval before acceptance. All material found during the progress to have defects will be rejected and the CONTRACTOR shall promptly remove such defective material from the site of the WORK.

3.2 BEDDING

A. Pipe bedding shall conform to the requirements of Section 02200, "Earthwork;" except, that where the depth of trench is such that the cover over the top of the pipe is 2 feet or less, "Concrete Encasement" Bedding shall be used.

3.3 LAYING PIPE

A. ABS and PVC composite pipe shall be installed in conformance with the requirements of the pipe manufacturer's written recommendations and the provisions of this Section.

B. Handling of the pipe shall be done with care to insure that the pipe is not damaged in any manner during storage, loading, transit, unloading, and installation.

C. The pipe shall be laid to the lines and grades shown on the drawings and the sections shall be closely jointed to form a smooth flow line. Immediately before placing each section of pipe in final position for jointing, the bedding for the pipe shall be checked for firmness and uniformity of surface.

D. The radius of curvature of the trench shall determine the maximum length of pipe section that can be used without exceeding the allowable deflection at a coupling. The deflection at any joint shall not exceed that prescribed by the manufacturer of the pipe. The manufacturer's printed installation guide showing the radii of curvature that can be attained with pipe sections of various lengths shall be followed.

E. Proper implements, tools, and facilities as recommended by the pipe manufacturer's standard printed installation instructions shall be provided and used by the CONTRACTOR for safe and efficient execution of the WORK. All pipe and accessories shall be carefully lowered into the trench by means of derrick, ropes, or other suitable equipment in such a manner as to prevent damage to pipe and fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

F. Cutting and machining of the pipe shall be accomplished in accordance with the pipe manufacturer's standard procedures for this operation. Pipe shall not be cut with a cold chisel, standard iron pipe cutter, nor any other method that may fracture the pipe or will produce ragged, uneven edges.

G. The pipe and accessories shall be inspected for defects prior to lowering into the trench. Any defective, damaged or unsound pipe shall be repaired or replaced. All foreign matter or dirt shall be removed from the interior of the pipe before lowering into position in the trench. Pipe shall be kept clean during and after laying. All openings in the pipe line shall be closed with water tight expandable type sewer plugs or test plugs at the end of each day's operation or whenever the pipe openings are left unattended. The use of burlap, wood, or other similar plugs will not be permitted.

H. Adequate protection and maintenance of all underground and surface utility structures, drains, sewers, and other obstructions encountered in the progress of the WORK shall be furnished by the CONTRACTOR at its own expense.

I. Where the grade or alignment of the pipe is obstructed by existing utility structures such as conduits, ducts, pipes, branch connections to main sewers, or main drains, the obstruction shall be permanently supported, relocated, removed, or reconstructed by the CONTRACTOR in cooperation with owners of such utility structures. Unless otherwise

indicated, such work shall be performed at the CONTRACTOR's expense.

3.4 FIELD JOINTING

A. **General:** The pipe shall not be deflected either vertically or horizontally in excess of the printed recommendations of the manufacturer of the coupling.

B. When pipe laying is not in progress, the open ends of the pipe shall be closed by approved means to prevent trench water from entering pipe. Adequate backfill shall be deposited on pipe to prevent floating of pipe. Any pipe which has floated shall be removed from the trench, cleaned, and relaid in an acceptable manner. No pipe shall be laid when, in the opinion of the ENGINEER, the trench conditions or weather are unsuitable for such work.

C. **Solvent-Weld Joints:** Each solvent-weld pipe joint shall be sealed with solvent cement in conformance with the requirements of ASTM D 2680 and the manufacturer's printed recommendations. The spigot and socket shall be wiped clean before the solvent cement is applied.

D. **Gasketed Joints:** Each gasketed pipe joint shall be joined with a lock-in elastomeric gasket. The gasket and the gasket seal inside the bell shall be wiped clean before the gasket is inserted. At this time a liberal amount of lubricant shall be applied to the gasket and to the outside of the clean pipe end. Lubricant other than that furnished with the pipe shall not be used. The end of the pipe shall then be forced into the bell to complete the joint. On field cut spigot ends, the outer pipe wall shall be chamfered with a file to remove all burrs and rough spots.

- END OF SECTION -

SECTION 03100 - CONCRETE FORMWORK

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish concrete formwork, bracing, shoring, and supports and shall design and construct falsework in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Government Standards:

PS 1	Construction and Industrial Plywood
PS 20	American Softwood Lumber Standard

B. Commercial Standards:

ACI 117	Standard Tolerances for Concrete Construction and Materials

1.3 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 01300 - Contractor Submittals.

B. Manufacturer's information demonstrating compliance with requirements.

1. Form ties and related accessories, including taper tie plugs, if taper ties are used.
2. Form gaskets.
3. Form release agent, including NSF certification.
4. List of form materials and locations for use.

C. **Shop Drawings:** Detailed plans of the falsework proposed to be used. Such plans shall be in sufficient detail to indicate the general layout, sizes of members, anticipated stresses, grade of materials to be used in the falsework, means of protecting existing construction which supports falsework, and typical soil conditions. Include a list of form materials and locations for use.

1.4 QUALITY ASSURANCE

A. **Tolerances:** The variation from required lines or grade shall not exceed 1/4-inch in 10 feet and there shall be no offsets or visible waviness in the finished surface. All other tolerances shall be within the tolerances of ACI 117.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Except as otherwise expressly accepted by the ENGINEER, lumber brought on the Site for use as forms, shoring, or bracing shall be new material. Forms shall be smooth surface forms and shall be of the following materials:

B. Form materials which may remain or leave residues on or in the concrete shall be certified as compliant with NSF Standard 61.

2.2 FORM AND FALSEWORK MATERIALS

A. Materials for concrete forms, formwork, and falsework shall conform to the following requirements:

1. Lumber shall be Douglas Fir or Southern Yellow Pine, construction grade or better, in conformance with U.S. Product Standard PS 20.
2. Plywood for concrete formwork shall be new, waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Yellow Pine plywood manufactured especially for concrete formwork, shall conform to the requirements of PS 1 for Concrete Forms, Class I, and shall be edge sealed.
3. Form materials shall be metal, wood, plywood, or other material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line, and grade indicated. Metal forms shall accomplish such results. Wood forms for surfaces to be painted shall be Medium Density Overlaid plywood, MDO Ext. Grade.

B. Unless otherwise indicated, exterior corners in concrete members shall be provided with 3/4-inch chamfers or be tooled to 1/2-inch radius. Re-entrant corners in concrete members shall not have fillets unless otherwise indicated.

C. Forms and falsework to support the roof and floor slabs shall be designed for the total dead load, plus a live load of 50 psf minimum. The minimum design load for combined dead and live loads shall be 100 psf.

2.3 FORM TIES

A. Form ties shall be provided with a plastic cone or other suitable means for forming a conical hole to insure that the form tie may be broken off back of the face of the concrete. The maximum diameter of removable cones for rod ties, or of other removable form-tie fasteners having a circular cross-section, shall not exceed 1-1/2 inches; and all such fasteners shall be such as to leave holes of regular shape for reaming. Form ties for water-retaining structures shall have integral waterstops that tightly fit the form tie so that they cannot be moved from mid-point of the tie.

B. Removable taper ties may be used when approved by the ENGINEER. A preformed neoprene or polyurethane tapered plug sized to seat at the center of the wall shall be inserted in the hole left by the removal of the taper tie.

PART 3 -- EXECUTION

3.1 GENERAL

A. Forms to confine the concrete and shape it to the required lines shall be used wherever necessary. The CONTRACTOR shall assume full responsibility for the adequate design of all forms, and any forms which are unsafe or inadequate in any respect shall promptly be removed from the WORK and replaced. Provide worker protection from protruding reinforcement bars in accordance with applicable safety codes. A sufficient number of forms of each kind shall be available to permit the required rate of progress to be maintained. The design and inspection of concrete forms, falsework, and shoring shall comply with applicable local, state and Federal regulations. Plumb and string lines shall be installed before concrete placement and shall be maintained during placement. Such lines shall be used by CONTRACTOR's personnel and by the ENGINEER and shall be in sufficient number and properly installed. During concrete placement, the CONTRACTOR shall continually monitor plumb and string line form positions and immediately correct deficiencies.

B. Concrete forms shall conform to the shape, lines, and dimensions of members required, and 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. If adequate foundation for shores cannot be secured, trussed supports shall be provided.

3.2 FORM DESIGN

A. Forms shall be true in every respect to the required shape and size, shall conform to the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. Suitable and effective means shall be provided on all forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete. Plywood, 5/8-inch and greater in thickness, may be fastened directly to studding if the studs are spaced close enough to prevent visible deflection marks in the concrete. The forms shall be tight so as to prevent the loss of water, cement and fines during placing and vibrating of the concrete. Specifically, the bottom of wall forms that rest on concrete footings or slabs shall be provided with a gasket to prevent loss of fines and paste during placement and vibration of concrete. Such gasket may be a 1- to 1-1/2-inch diameter polyethylene rod held in position to the underside of the wall form. Adequate clean-out holes shall be provided at the bottom of each lift of forms. The size, number, and location of such clean-outs shall be as acceptable to the ENGINEER. Whenever concrete cannot be placed from the top of a wall form in a manner that meets the requirements of the Contract Documents, form windows shall be provided in the size and spacing needed to allow placement of concrete to the requirements of Section 03300 - Cast-in-Place Concrete. The size, number, and location of such form windows shall be as acceptable to the ENGINEER.

3.3 CONSTRUCTION

A. **Vertical Surfaces:** All vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is indicated. Not less than 1-inch of concrete shall be added to the indicated thickness of a concrete member where concrete is permitted to be placed against trimmed ground in lieu of forms. Permission to do this on other concrete members will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed.

B. **Construction Joints:** Concrete construction joints will not be permitted at locations other than those indicated, except as may be acceptable to the ENGINEER. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location, and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete. Pipe stubs and anchor bolts shall be set in the forms where required.

C. Form Ties:

1. Embedded Ties: Holes left by the removal of form tie cones shall be reamed with suitable toothed reamers so as to leave the surface of the holes clean and rough before being filled with mortar. Wire ties for holding forms will not be permitted. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete members. The use of snap-ties which cause spalling of the concrete upon form stripping or tie removal will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 1-inch back from the formed face or faces of the concrete.
2. Removable Ties: Where taper ties are approved for use, the larger end of the taper tie shall be on the wet side of walls in water retaining structures. After the taper tie is removed, the hole shall be thoroughly cleaned and roughened for bond. A precast neoprene or polyurethane tapered plug shall be located at the wall centerline. The hole shall be completely filled with non-shrink grout for water bearing and below-grade walls. The hole shall be completely filled with non-shrink or regular cement grout for above-grade walls which are dry on both sides. Exposed faces of walls shall have the outer 2 inches of the exposed face filled with a cement grout which shall match the color and texture of the surrounding wall surface.

3.4 REUSE OF FORMS

A. Forms may be reused only if in good condition and only if acceptable to the ENGINEER. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on all exposed concrete surfaces. Exposed

concrete surfaces are defined as surfaces which are permanently exposed to view. In the case of forms for the inside wall surfaces of hydraulic/water retaining structures, unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the ENGINEER.

3.5 REMOVAL OF FORMS

A. Careful procedures for the removal of forms shall be strictly followed, and this work shall be done with care so as to avoid injury to the concrete. No heavy loading on green concrete will be permitted. In the case of roof slabs and above-ground floor slabs, forms shall remain in place until test cylinders for the roof concrete attain a minimum compressive strength of 75 percent of the 28-day strength in Section 03300 - Cast-in-Place Concrete. No forms shall be disturbed or removed under an individual panel or unit before the concrete in the adjacent panel or unit has attained 75 percent of the 28-day strength and has been in place for a minimum of 7 days. The time required to establish said strength shall be as determined by the ENGINEER who will make several test cylinders for this purpose from concrete used in the first group of roof panels placed. If the time so determined is more than the 7-day minimum, then that time shall be used as the minimum length of time. Forms for vertical walls of waterholding structures shall remain in place at least 36 hours after the concrete has been placed. Forms for parts of the WORK not specifically mentioned herein shall remain in place for periods of time as recommended in ACI 347.

3.6 MAINTENANCE OF FORMS

A. Forms shall be maintained at all times in good condition, particularly as to size, shape, strength, rigidity, tightness, and smoothness of surface. Before concrete is placed, the forms shall be thoroughly cleaned. The form surfaces shall be treated with a nonstaining mineral oil or other lubricant acceptable to the ENGINEER. Any excess lubricant shall be satisfactorily removed before placing the concrete. Where field oiling of forms is required, the CONTRACTOR shall perform the oiling at least two weeks in advance of their use. Care shall be exercised to keep oil off the surfaces of steel reinforcement and other metal items to be embedded in concrete.

3.7 FALSEWORK

A. The CONTRACTOR shall be responsible for the design, engineering, construction, maintenance, and safety of all falsework, including staging, walkways, forms, ladders, and similar appurtenances, which shall equal or exceed the applicable requirements of the provisions of the OSHA Safety and Health Standards for Construction, the requirements of the Construction Safety Orders of the California Division of Industrial Safety, and the requirements herein.

B. Falsework shall be designed and constructed to provide the necessary rigidity and to support the loads. Falsework for the support of a superstructure shall be designed to support the loads that would be imposed if the entire superstructure were placed at one time.

C. Falsework shall be placed upon a solid footing, safe against undermining, and protected from softening. When the falsework is supported on timber piles, the

maximum calculated pile loading shall not exceed 20 tons. When falsework is supported on any portion of the structure which is already constructed, the load imposed by the falsework shall be spread, distributed, and braced in such a way as to avoid any possibility of damage to the structure.

END OF SECTION

SECTION 03200 - REINFORCEMENT STEEL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish, fabricate, and place all concrete reinforcement steel, welded wire fabric, couplers, and concrete inserts for use in reinforced concrete and masonry construction and shall perform all appurtenant work, including all the wires, clips, supports, chairs, spacers, and other accessories, all in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards

ACI 315	Details and Detailing of Concrete Reinforcement
ACI 318	Building Code Requirements for Reinforced Concrete
CRSI MSP-1	Concrete Reinforcing Steel Institute Manual of Standard Practice
WRI	Manual of Standard Practice for Welded Wire Fabric
AWS D1.4	Structural Welding Code - Reinforcing Steel
ASTM A 82	Specification for Steel Wire, Plain, for Concrete Reinforcement
ASTM A 185	Specification for Welded Steel Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 615	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 775	Specification for Epoxy-Coated Reinforcing Steel Bars

1.3 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall furnish shop bending diagrams, placing lists, and drawings of all reinforcement steel prior to fabrication in accordance with the requirements of Section 01300, "Contractor Submittals."

B. Details of the concrete reinforcement steel and concrete inserts shall be submitted by the CONTRACTOR at the earliest possible date after receipt by the CONTRACTOR of the Notice to Proceed. Said details of reinforcement steel for

fabrication and erection shall conform to ACI 315 and the requirements specified and shown. The shop bending diagrams shall show the actual lengths of bars, to the nearest inch measured to the intersection of the extensions (tangents for bars of circular cross section) of the outside surface. The shop drawings shall include bar placement diagrams which clearly indicate the dimensions of each bar splice.

C. Where mechanical couplers are required or permitted to be used to splice reinforcement steel, the CONTRACTOR shall submit manufacturer's literature which contains instructions and recommendations for installation for each type of coupler used; certified test reports which verify the load capacity of each type and size of coupler used; and shop drawings which show the location of each coupler with details of how they are to be installed in the formwork.

D. If reinforcement steel is spliced by welding at any location, the CONTRACTOR shall submit mill test reports which shall contain the information necessary for the determination of the carbon equivalent as specified in AWS D1.4. The CONTRACTOR shall submit a written welding procedure for each type of weld for each size of bar which is to be spliced by welding; merely a statement that AWS procedures will be followed is not acceptable.

1.4 QUALITY ASSURANCE

A. If requested by the ENGINEER, the CONTRACTOR shall provide samples from each heat of reinforcement steel delivered in a quantity adequate for testing. Costs of initial tests will be paid by the OWNER. Costs of additional tests due to material failing initial tests shall be paid by the CONTRACTOR.

B. If reinforcement steel is spliced by welding at any location, the CONTRACTOR shall submit certifications of procedure qualifications for each welding procedure used and certification of welder qualifications, for each welding procedure, and for each welder performing the work. Such qualifications shall be as specified in AWS D1.4.

C. If requested by the ENGINEER, the CONTRACTOR shall provide samples of each type of welded splice used in the work in a quantity and of dimensions adequate for testing. At the discretion of the ENGINEER, radiographic testing of direct butt welded splices will be performed. The CONTRACTOR shall provide assistance necessary to facilitate testing. The CONTRACTOR shall repair any weld which fails to meet the requirements of AWS D1.4. The costs of testing will be paid by the OWNER; except, the costs of all tests which fail to meet specified requirements shall be paid by the CONTRACTOR.

PART 2 -- PRODUCTS

2.1 MATERIAL REQUIREMENTS

A. Materials specified in this Section which may remain or leave residues on or within the concrete shall be classified as acceptable for potable water use by the Environmental Protection Agency within 30 days of application or use.

2.2 REINFORCEMENT STEEL

A. Reinforcement Steel for all cast-in-place reinforced concrete construction shall conform to the following requirements:

1. Bar reinforcement shall conform to the requirements of ASTM A 615 for Grade 60 Billet Steel Reinforcement or as otherwise shown.

2. Welded wire fabric reinforcement shall conform to the requirements of ASTM A 185 and the details shown; provided, that welded wire fabric with longitudinal wire of W4 size wire and smaller shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10 inches; and provided further, that welded wire fabric with longitudinal wires larger than W4 size shall be furnished in flat sheets only.

3. Spiral reinforcement shall be cold-drawn steel wire conforming to the requirements of ASTM A 82.

B. Accessories

1. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers, and other devices to position reinforcement during concrete placement. All bar supports shall meet the requirements of the CRSI Manual of Standard Practice including special requirements for supporting epoxy coated reinforcing bars. Wire bar supports shall be CRSI Class 1 for maximum protection with a 1/8-inch minimum thickness of plastic coating which extends at least 1/2-inch from the concrete surface. Plastic shall be gray in color.

2. Concrete blocks (dobies), used to support and position reinforcement steel, shall have the same or higher compressive strength as specified for the concrete in which it is located. Wire ties shall be embedded in concrete block bar supports.

C. Epoxy coating for reinforcing and accessories, where specified or shown, shall conform to ASTM A 775.

2.3 MECHANICAL COUPLERS

A. Mechanical couplers shall be provided where shown and where approved by the ENGINEER. The couplers shall develop a tensile strength which exceeds 125 percent of the yield strength of the reinforcement bars being spliced at each splice.

B. Where the type of coupler used is composed of more than one component, all components required for a complete splice shall be supplied. This shall apply to all mechanical splices, including those splices intended for future connections.

C. The reinforcement steel and coupler used shall be compatible for obtaining the required strength of the connection. Straight threaded type couplers shall require the use of the next larger size reinforcing bar or shall be used with reinforcing bars with specially forged ends which provide upset threads which do not decrease the basic cross section of the bar.

2.4 WELDED SPLICES

A. Welded splices shall be provided where shown and where approved by the ENGINEER. All welded splices of reinforcement steel shall develop a tensile strength which exceeds 125 percent of the yield strength of the reinforcement bars which are connected.

B. All materials required to conform the welded splices to the requirements of AWS D1.4 shall be provided.

2.5 EPOXY GROUT

A. Epoxy for grouting reinforcing bars shall be specifically formulated for such application, for the moisture condition, application temperature, and orientation of the hole to be filled. Epoxy grout shall meet the requirements found in Section 03315, "Grout."

PART 3 -- EXECUTION

3.1 GENERAL

A. All reinforcement steel, welded wire fabric, couplers, and other appurtenances shall be fabricated, and placed in accordance with the requirements of the Building Code and the supplementary requirements specified herein.

3.2 FABRICATION

A. General

1. 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 modified by the Drawings. Stirrups and tie bars shall be bent around a pin having a diameter not less than 1-1/2-inch for No. 3 bars, 2-inch for No. 4 bars, and 2-1/2-inch for No. 5 bars. Bends for other bars shall be made around a pin having a diameter not less than 6 times the bar diameter, except for bars larger than 1 inch, in which case the bends shall be made around a pin of 8 bar diameters. Bars shall be bent cold.

2. The CONTRACTOR shall fabricate reinforcement bars for structures in accordance with bending diagrams, placing lists, and placing drawings. Said drawings, diagrams, and lists shall be prepared by the CONTRACTOR as specified under Section 01300, "Contractor Submittals."

B. **Fabricating Tolerances:** Bars used for concrete reinforcement shall meet the following requirements for fabricating tolerances:

1. Sheared length: $\pm$ 1 inch

2. Depth of truss bars: + 0, - 1/2 inch

3. Stirrups, ties, and spirals: ± 1/2 inch

4. All other bends: ± 1 inch

3.3 PLACING

A. Reinforcement steel shall be accurately positioned as shown, and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcement steel shall be supported by concrete, plastic or metal supports, spacers or metal hangers which are strong and rigid enough to prevent any displacement of the reinforcement steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used, in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. All concrete blocks used to support reinforcement steel shall be tied to the steel with wire ties which are embedded in the blocks. For concrete over formwork, the CONTRACTOR shall furnish concrete, metal, plastic, or other acceptable bar chairs and spacers.

B. Limitations on the use of bar support materials shall be as follows.

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.

C. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.

D. Bars additional to those shown which may be found necessary or desirable by the CONTRACTOR for the purpose of securing reinforcement in position shall be provided by the CONTRACTOR at its own expense.

E. Unless otherwise specified, reinforcement placing tolerances shall be within the limits specified in Section 7.5 of ACI 318 except where in conflict with the requirements of the Building Code.

F. Bars may be moved as necessary to avoid interference with other reinforcement steel, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be as acceptable to the ENGINEER.

G. Welded wire fabric reinforcement placed over horizontal forms shall be supported on slab bolsters. Slab bolsters shall be spaced not more than 30 inches on centers, shall extend continuously across the entire width of the reinforcement mat, and shall support the reinforcement mat in the plane shown.

H. 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.

I. Epoxy coated reinforcing bars shall be stored, transported, and placed in such a manner as to avoid chipping of the epoxy coating. Non-abrasive slings made of nylon and similar materials shall be used. Specially coated bar supports shall be used. All chips or cracks in the epoxy coating shall be repaired with a compatible epoxy repair material prior to placing concrete.

J. Accessories supporting reinforcing bars shall be spaced such that there is no deflection of the accessory from the weight of the supported bars. When used to space the reinforcing bars from wall forms, the forms and bars shall be located so that there is no deflection of the accessory when the forms are tightened into position.

3.4 SPACING OF BARS

A. The clear distance between parallel bars (except in columns and between multiple layers of bars in beams) shall be not less than the nominal diameter of the bars nor less than 1-1/3 times the maximum size of the coarse aggregate, nor less than one inch.

B. Where reinforcement in beams or girders is placed in 2 or more layers, the clear distance between layers shall be not less than one inch.

C. In columns, the clear distance between longitudinal bars shall be not less than 1-1/2 times the bar diameter, nor less than 1-1/2 times the maximum size of the coarse aggregate, nor less than 1-1/2 inches.

D. The clear distance between bars shall also apply to the distance between a contact splice and adjacent splices or bars.

3.5 SPLICING

A. General

1. Reinforcement bar splices shall only be used at locations shown. When it is necessary to splice reinforcement at points other than where shown, the character of the splice shall be as acceptable to the ENGINEER.

2. Unless otherwise indicated, dowels shall match the size and spacing of the spliced bar.

B. Splices of Reinforcement

1. The length of lap for reinforcement bars, unless otherwise shown shall be in accordance with ACI 318-89, Section 12.15.1 for a Class B splice.

2. 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. Splices in column spiral reinforcement, when necessary, shall be made by welding or by a lap of 1-1/2 turns.

C. Bending or Straightening

1. Reinforcement shall not be straightened or rebent in a manner which will injure the material. Bars with kinks or bends not shown shall not be used. All bars shall be bent cold, unless otherwise permitted by the ENGINEER. No bars partially embedded in concrete shall be field-bent except as shown or specifically permitted by the ENGINEER.

D. Couplers which are located at a joint face shall be a type which can be set either flush or recessed from the face as shown. The couplers shall be sealed during concrete placement to completely eliminate concrete or cement paste from entering. Couplers intended for future connections shall be recessed a minimum of 1/2 inch from the concrete surface. After the concrete is placed, the coupler shall be plugged with plastic plugs which have an O-ring seal and the recess filled with sealant to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged .

E. Unless noted otherwise, mechanical coupler spacing and capacity shall match the spacing and capacity of the reinforcing shown for the adjacent section.

3.6 CLEANING AND PROTECTION

A. Reinforcement steel shall at all times be protected from conditions conducive to corrosion until concrete is placed around it.

B. The surfaces of all reinforcement steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcement shall be reinspected and, if necessary recleaned.

3.7 EMBEDMENT OF DRILLED REINFORCING STEEL DOWELS

A. Hole Preparation

1. The hole diameter shall be as recommended by the epoxy manufacturer but shall be no larger than 0.25 inch greater than the diameter of the outer surface of the reinforcing bar deformations.

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 which 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 that insures that excess material will be expelled from the hole during dowel placement.

7. Dowels shall be twisted during insertion into the partially filled hole so as to guarantee full wetting of the bar surface with epoxy. The bar shall be inserted slowly enough to avoid developing air pockets.

- END OF SECTION -

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish all materials for concrete in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other work as required to produce finished concrete, in accordance with the requirements of the Contract Documents.

B. The following types of concrete are covered in this Section:

1. Structural Concrete: Concrete to be used in all cases except where indicated otherwise in the Contract Documents.

2. Sitework Concrete: Concrete to be used for curbs, gutters, catch basins, sidewalks, pavements, fence and guard post embedment, underground duct bank encasement and all other concrete appurtenant to electrical facilities unless otherwise indicated.

3. Lean Concrete: Concrete to be used for thrust blocks, pipe trench cut-off blocks and cradles that are detailed on the Drawings as unreinforced. Lean concrete shall be used as protective cover for dowels intended for future connection.

C. The term "hydraulic structure" used in these specifications means environmental engineering concrete structures for the containment, treatment, or transmission of water, wastewater, or other fluids.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Federal Specifications:

UU-B-790A (1) (2)	Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellant and Fire Resistant)

B. Commercial Standards:

ACI 117	Standard Tolerances for Concrete Construction and Materials
ACI 214	Recommended Practice for Evaluation of Strength Test Results of Concrete
ACI 301	Structural Concrete for Buildings
ACI 306.1	Cold Weather Concreting
ACI 309	Consolidation of Concrete
ACI 315	Details and Detailing of Concrete Reinforcement
ACI 318	Building Code Requirements for Reinforced Concrete
ASTM C 31	Practices for Making and Curing Concrete Test
ASTM C 33	Concrete Aggregates
ASTM C 39	Test Method for Compressive Strength of Cylindrical

	Concrete Specimens
ASTM C 94	Ready-Mixed Concrete
ASTM C 136	Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 143	Test Method for Slump of Hydraulic Cement Concrete
ASTM C 150	Portland Cement
ASTM C 156	Test Methods for Water Retention by Concrete Curing Materials
ASTM C 157	Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete
ASTM C 192	Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 260	Air-Entraining Admixtures for Concrete
ASTM C 309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	Chemical Admixtures for Concrete
ASTM C 1077	Practice for Laboratories Testing Concrete and Concrete Aggregates for use in Construction & Criteria for Laboratory Evaluation
ASTM D 448	Classification for Sizes of Aggregate for Road and Bridge Construction
ASTM D 2419	Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM E 119	Method for Fire Tests of Building Construction and Materials
ASTM E 1643	Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
ASTM E 1745	Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs

1.3 CONTRACTOR SUBMITTALS

A. Mix Designs: Prior to beginning the WORK and within 14 days of the notice to proceed, the CONTRACTOR shall submit to the ENGINEER, for review, preliminary concrete mix designs which shall show the proportions and gradations of all materials proposed for each class and type of concrete specified herein in accordance with Section 01300 - Contractor Submittals. The mix designs shall be checked by an independent testing laboratory acceptable to the ENGINEER. All costs related to such checking shall be borne by the CONTRACTOR. Since laboratory trial batches require 35 calendar days to complete, the CONTRACTOR may consider testing more than one mix design for each class of concrete.

B. Delivery Tickets: Where ready-mix concrete is used, the CONTRACTOR shall furnish delivery tickets at the time of delivery of each load of concrete. Each ticket shall show the state certified equipment used for measuring and the total quantities, by weight, of cement, sand, each class of aggregate, admixtures, and the amounts of water in the aggregate added at the batching plant, and the amount allowed to be added at the site for the specific design mix. In addition, each ticket shall state the mix number, total yield in cubic yards, and the time of day, to the nearest minute, corresponding to the times when the batch was dispatched, when it left the plant, when it arrived at the site, when unloading began, and when unloading was finished.

C. Furnish the following submittals in accordance with ACI 301:
   1. Mill tests for cement.

   2. Admixture certification. Chloride ion content must be included.

   3. Aggregate gradation test results and certification.

   4. Materials and methods for curing.

1.4 CONCRETE CONFERENCE

A. A meeting to review the detailed requirements of the CONTRACTOR's proposed concrete design mixes and to determine the procedures for producing proper concrete construction shall be held no later than 14 days after the notice to proceed.

B. All parties involved in the concrete work shall attend the conference, including the following at a minimum:

   CONTRACTOR's representative
   Testing laboratory representative
   Concrete subcontractor
   Reinforcing steel subcontractor and detailer
   Concrete supplier
   Admixture manufacturer's representative

C. The conference shall be held at a mutually agreed upon time and place. The ENGINEER shall be notified no less than 5 days prior to the date of the conference.

1.5 QUALITY ASSURANCE

A. General

   1. Tests on component materials and for compressive strength and shrinkage of concrete shall be performed as indicated herein. Test for determining slump will be in accordance with the requirements of ASTM C 143.

   2. Testing for aggregate shall include sand equivalence, reactivity, organic impurities, abrasion resistance, and soundness, according to ASTM C 33.

   3. The cost of all laboratory tests on cement, aggregates, and concrete, will be borne by the OWNER. However, the CONTRACTOR shall pay the cost of any additional tests and investigation on WORK performed which does not meet the specifications. The laboratory will meet or exceed the requirements of ASTM C 1077.

   4. Concrete for testing shall be supplied by the CONTRACTOR, and the CONTRACTOR shall assist the ENGINEER in obtaining samples, and

disposal and cleanup of excess material.

B. Field Compression Tests:

1. Compression test specimens will be taken during construction from the first placement of each class of concrete specified herein and at intervals thereafter as selected by the ENGINEER to insure continued compliance with these specifications. Each set of test specimens will be a minimum of 5 cylinders.

2. Compression test specimens for concrete shall be made in accordance with section 9.2 of ASTM C 31. Specimens shall be 6-inch diameter by 12-inch high cylinders.

3. Compression tests shall be performed in accordance with ASTM C 39. One test cylinder will be tested at 7 days and 2 at 28 days. The remaining cylinders will be held to verify test results, if needed.

C. Evaluation and Acceptance of Concrete:

1. Evaluation and acceptance of the compressive strength of concrete will be according to the requirements of ACI 318, Chapter 5 "Concrete Quality," and as indicated herein.

2. A statistical analysis of compression test results will be performed according to the requirements of ACI 214. The standard deviation of the test results shall not exceed 640 psi, when ordered at equivalent water content as estimated by slump.

3. If any concrete fails to meet these requirements, immediate corrective action shall be taken to increase the compressive strength for all subsequent batches of the type of concrete affected.

4. When the standard deviation of the test results exceeds 640 psi, the average strength for which the mix is designed shall be increased by an amount necessary to satisfy the statistical requirement that the probability of any test being more than 500 psi below or the average of any 3 consecutive tests being below the required compressive strength is 1 in 100. The required average strength shall be calculated by Criterion No. 3 of ACI 214 using the actual standard of deviation.

5. All concrete which fails to meet the ACI requirements and these specifications, is subject to removal and replacement.

D. Shrinkage Tests:

1. Drying shrinkage tests shall be performed for the trial batch indicated in the Paragraph in Part 2 entitled "Trial Batch and Laboratory Tests," the first placement of each class of concrete, and during construction to insure continued compliance with these Specifications.

2. Drying shrinkage specimens shall be 4-inch by 4-inch by 11-inch prisms with an effective gage length of 10 inches; fabricated, cured, dried, and measured in accordance with ASTM C 157 modified as follows: specimens shall be removed from molds at an age of 23 plus or minus 1 hours after trial batching, shall be placed immediately in water at 70 degrees F plus or minus 3 degrees F for at least 30 minutes, and shall be measured within 30 minutes thereafter to determine original length and then submerged in saturated lime water at 73 degrees F plus or minus 3 degrees F. Measurement to determine expansion expressed as a percentage of original length shall be made at age 7 days. This length at age 7 days shall be the base length for drying shrinkage calculations ("0" days drying age). Specimens then shall be stored immediately in a humidity control room maintained at 73 degrees F plus or minus 3 degrees F and 50 percent plus or minus 4 percent relative humidity for the remainder of the test. Measurements to determine shrinkage expressed as percentage of base length shall be made and reported separately for 7, 14, 21, and 28 days of drying after 7 days of moist curing.

3. The drying shrinkage deformation of each specimen shall be computed as the difference between the base length (at "0" days drying age) and the length after drying at each test age. The average drying shrinkage deformation of the specimens shall be computed to the nearest 0.0001 inch at each test age. If the drying shrinkage of any specimen departs from the average of that test age by more than 0.0004-inch, the results obtained from that specimen shall be disregarded. Results of the shrinkage test shall be reported to the nearest 0.001 percent of shrinkage. Compression test specimens shall be taken in each case from the same concrete used for preparing drying shrinkage specimens. These tests shall be considered a part of the normal compression tests for the project. Allowable shrinkage limitations shall be as indicated in Part 2 below.

E. Construction Tolerances: The CONTRACTOR shall set and maintain concrete forms and perform finishing operations to ensure that the completed WORK is within tolerances. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance is the permissible variation from lines, grades, or dimensions indicated on the Drawings. Where tolerances are not stated in the specifications, permissible deviations will be in accordance with ACI 117.

1. The following construction tolerances apply to finished walls and slab unless otherwise indicated:

Item	Tolerance
Variation of the constructed linear outline from the established position in plan.	In 10 feet: 1/4-inch; In 20 feet or more: ½ inch
Variation from the level or from the grades shown.	In 10 feet: 1/4-inch; In 20 feet or more: ½ inch

Variation from the plumb	In 10 feet: 1/4-inch; In 20 feet or more: ½ inch
Variation in the thickness of slabs and walls.	Minus 1/2-inch; Plus ½ - inch
Variation in the locations and sizes of slabs and wall openings	Plus or minus 1/4-inch

PART 2 – PRODUCTS

2.1 CONCRETE MATERIALS

A. General:
   1. All materials shall be classified as acceptable for potable water use according to ASTM C 1602.

   2. Cement for concrete which will contact potable water shall not be obtained from kilns which burn metal rich hazardous waste fuel.

   3. Materials shall be delivered, stored, and handled so as to prevent damage by water or breakage. Cement reclaimed from cleaning bags or leaking containers shall not be used. All cement shall be used in the sequence of receipt of shipments.

B. All materials shall comply with the requirements of Sections 201, 203, and 204 of ACI 301, as applicable.

C. Storage of materials shall conform to the requirements of Section 205 of ACI 301.

D. Materials for concrete shall conform to the following requirements:

   1. Cement shall be standard brand Portland cement conforming to ASTM C 150 for Type II or Type V, including Table 2 optional requirements. A minimum of 85 percent of cement by weight shall pass a 325 screen. A single brand of cement shall be used throughout the work, and prior to its use, the brand shall be acceptable to the ENGINEER. The cement shall be suitably protected from exposure to moisture until used. Cement that has become lumpy shall not be used. Sacked cement shall be stored in such a manner so as to permit access for inspection and sampling. Certified mill test reports, including fineness, for each shipment of cement to be used shall be submitted to the ENGINEER, if requested, regarding compliance with these Specifications.

   2. Water for mixing and curing shall be potable, clean, and free from objectionable quantities of silty organic matter, alkali, salts, and other impurities. The water shall be considered potable, for the purposes of this Section only, if it meets the requirements of the local governmental agencies. Agricultural water with high total dissolved solids (over 1000 mg/l TDS) shall

not be used.

3. Aggregates shall be obtained from pits acceptable to the ENGINEER, shall be non-reactive, and shall conform to ASTM C 33. Maximum size of coarse aggregate shall be as indicated herein. Lightweight sand for fine aggregate will not be permitted.

    a. Coarse aggregates shall consist of clean, hard, durable gravel, crushed gravel, crushed rock, or a combination thereof. The coarse aggregates shall be prepared and handled in two or more size groups for combined aggregates with a maximum size greater than 3/4-inch. When the aggregates are proportioned for each batch of concrete, the two size groups shall be combined. See the Paragraph in Part 2 entitled "Trial Batch and Laboratory Tests" for the use of the size groups.

    b. Fine aggregates shall be natural sand or a combination of natural and manufactured sand that are hard and durable. When tested in accordance with ASTM D 2419, the sand equivalency shall not be less than 75 percent for an average of three samples, nor less than 70 percent for an individual test. Gradation of fine aggregate shall conform to ASTM C 33. The fineness modulus of sand used shall not be over 3.00.

    c. Combined aggregates shall be well graded from coarse to fine sizes and shall be uniformly graded between screen sizes to produce a concrete that has optimum workability and consolidation characteristics. Where a trial batch is required for a mix design, the final combined aggregate gradations will be established during the trial batch process.

    d. When tested in accordance with ASTM C 33, the ratio of silica released to reduction in alkalinity shall not exceed 1.0.

    e. When tested in accordance with ASTM C 33, the fine aggregate shall produce a color in the supernatant liquid no darker than the reference standard color solution.

    f. When tested in accordance with ASTM C 33, the coarse aggregate shall show a loss not exceeding 42 percent after 500 revolutions, or 10.5 percent after 100 revolutions.

    g. When tested in accordance with ASTM C 33, the loss resulting after five cycles shall not exceed 10 percent for fine or coarse aggregate when using sodium sulfate.

4. Ready-mix concrete shall conform to the requirements of ASTM C 94.

5. Admixtures: All admixtures shall be compatible and be furnished by a single manufacturer capable of providing qualified field service representation. Admixtures shall be used in accordance with manufacturer's recommendations. If the use of an admixture is producing an inferior end

result, the CONTRACTOR shall discontinue use of the admixture. Admixtures shall not contain thiocyanates nor more than 0.05 percent chloride ion, and shall be non-toxic after 30 days. Liquid admixtures requiring dosages greater than one-half gallon per cubic yard shall be considered to be water when determining the total amount of free water as specified in Section 2.6, "Consistency."

a. Air-entraining agent meeting the requirements of ASTM C 260 shall be used. Sufficient air-entraining agent shall be used to provide a total air content of 3 to 5 percent. The OWNER reserves the right, at any time, to sample and test the air-entraining agent. The air-entraining agent shall be added to the batch in a portion of the mixing water. The solution shall be batched by means of a mechanical batcher capable of accurate measurement. Air content shall be tested at the point of placement. Air entraining agent shall be on the approved list of chemical admixtures by the California Department of Transportation. Other admixtures will be considered when accompanied by a certificate of compliance that verifies the product complies with the appropriate ASTM designations and local environmental requirements..

b. Set controlling and water reducing admixtures: Admixtures may be added at the CONTRACTOR's option, subject to the ENGINEER's approval, to control the set, effect water reduction, and increase workability. The addition of an admixture shall be at the CONTRACTOR's expense. Concrete containing an admixture shall be first placed at a location determined by the ENGINEER. Admixtures shall conform to the requirements of ASTM C 494. The required quantity of cement shall be used in the mix regardless of whether or not an admixture is used.

(1) Concrete shall not contain more than one water reducing admixture.

(2) Set controlling admixture may be either with or without water-reducing properties. Where the air temperature at the time of placement is expected to be consistently greater than 80 degrees F, shall be used. Where the air temperature at the time of placement is expected to be consistently less than 40 degrees F, a non-corrosive set accelerating admixture such as products listed on the California Department of Transportation’s approved list of chemical admixtures or products that are accompanied by a certificate of compliance that verifies product compliance with ASTM designations.; or equal shall be used.

(3) Normal range water reducer shall conform to ASTM C 494, Type A. Products listed on the California Department of Transportation’s approved list of chemical admixtures or products that are accompanied by a certificate of compliance that verifies product compliance with ASTM designations shall be used. . The quantity of admixture used and the method of mixing shall be in accordance with the

Manufacturer's instructions and recommendations.

(4) High range water reducer shall conform to ASTM C 494, Type F or G. Products listed on the California Department of Transportation's approved list of chemical admixtures or products that are accompanied by a certificate of compliance that verifies product compliance with ASTM designations shall be used. . High range water reducer shall be measured and dispensed as recommended by the manufacturer. Water reducer shall be considered as part of the mixing water when calculating water cement ratio.

(5) If the high range water reducer is added to the concrete at the job site, it may be used in conjunction with the same water reducer added at the batch plant. Concrete shall have a slump of 3 inches plus or minus 1/2-inch prior to adding the high range water reducing admixture at the job site. The high range water reducing admixture shall be accurately measured and pressure injected into the mixer as a single dose by an experienced technician. A standby system shall be provided and tested prior to each day's operation of the job site system.

(6) Concrete shall be mixed at mixing speed for a minimum of 30 mixer revolutions after the addition of the high range water reducer.

(7) Flyash: Flyash shall not be used.

2.2 CURING MATERIALS

A. Materials for curing concrete as indicated herein shall conform to the following requirements and ASTM C 309:

1. All curing compounds shall be white pigmented and resin based. Sodium silicate compounds shall not be allowed. Water based resin curing compounds shall be used only where local air quality regulations prohibit the use of a solvent based compound.

2. Polyethylene sheet for use as concrete curing blanket shall be white and shall have a nominal thickness of 6 mils. The loss of moisture when determined in accordance with the requirements of ASTM C 156 shall not exceed 0.055 grams per square centimeter of surface.

3. Polyethylene-coated waterproof paper sheeting for use as concrete curing blanket shall consist of white polyethylene sheeting free of visible defects, uniform in appearance, have a nominal thickness of 2 mils, and be permanently bonded to waterproof paper conforming to the requirements of Federal Specification UU-B-790A (1) (2). The loss of moisture, when determined in accordance with the requirements of ASTM C 156, shall not exceed 0.055 gram per square centimeter of surface.

4. Polyethylene-coated burlap for use as concrete curing blanket shall be 4-mil thick, white opaque polyethylene film impregnated or extruded into one side

of the burlap. Burlap shall weigh not less than 9 ounces per square yard. The loss of moisture, when determined in accordance with the requirements of ASTM C 156, shall not exceed 0.055 grams per square centimeter of surface.

5. Curing mats for use in Curing Method 6 as indicated below, shall be heavy shag rugs or carpets or cotton mats quilted at 4 inches on center. Curing mats shall weigh a minimum of 12 ounces per square yard when dry.

6. Evaporation retardant shall be a material such as Confilm as manufactured by Master Builders; Eucobar as manufactured by Euclid Chemical Company; E-CON as manufactured by L & M Construction Chemicals, Inc. or equal.

2.3 NON-WATERSTOP JOINT MATERIALS

A. Materials for non-waterstop joints in concrete shall conform to the following requirements:

1. Preformed joint filler shall be a non-extruding, neoprene sponge or polyurethane type conforming to Section 03290 - Joints in Concrete.

2. Elastomeric joint sealer shall conform to the requirements of Section 07920 - Sealants and Caulking.

3. Mastic joint sealer shall be a material that does not contain evaporating solvents; that will tenaciously adhere to concrete surfaces; that will remain permanently resilient and pliable; that will not be affected by continuous presence of water and will not in any way contaminate potable water; and that will effectively seal the joints against moisture infiltration even when the joints are subject to movement due to expansion and contraction. The sealer shall be composed of special asphalts or similar materials blended with lubricating and plasticizing agents to form a tough, durable mastic substance containing no volatile oils or lubricants and shall be capable of meeting the test requirements set forth below, if testing is required by the ENGINEER.

2.4 MISCELLANEOUS MATERIALS

A. Dampproofing agent shall be an asphalt emulsion.

B. Bonding agents shall be epoxy adhesives conforming to the following:

1. For bonding freshly-mixed, plastic concrete to hardened concrete.

2. For bonding hardened concrete or masonry to steel.

C. Vapor Retarder: Vapor retarder shall be 30 mil thick, Class A, 3 ply, nylon or polyester cord reinforced high density polyethylene sheet laminated to a non-woven geotextile fabric, in accordance with ASTM E 1745.

D. Granular Material Above Vapor Retarder: Crushed stone, gravel, or sand with the

following size distribution and meeting the deleterious substance limits of ASTM C 33 for fine aggegrates.

Sieve Size	Percentage Passing
3/8-inch	100
4.75 mm	85-100
No. 100	10 – 30

E. Seams in vapor retarder sheet shall be sealed with tape, adhesive, or other material as recommended by sheet manufacturer for the areas to be sealed and sheet material.

2.5 CONCRETE DESIGN REQUIREMENTS

A. General: Concrete shall be composed of cement, admixtures, aggregates, and water of the qualities indicated. The exact proportions in which these materials are to be used for different parts of the work will be determined during the trial batch. 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. The aggregate gradations shall be formulated to provide fresh concrete that will not promote rock pockets around reinforcing steel or embedded items. The proportions shall be changed whenever necessary or desirable to meet the required results. All changes shall be subject to review by the ENGINEER.

B. Fine Aggregate Composition: In mix designs for structural concrete, the percentage of fine aggregate in total aggregate by weight, shall be as indicated in the following table.

Fine Aggregate	
Fineness Modulus	Maximum Percent
2.7 or less	41
2.7 to 2.8	42
2.8 to 2.9	43
2.9 to 3.0	44

For other concrete, the maximum percentage of fine aggregate of total aggregate, by weight, shall not exceed 50.

C. Water-Cement Ratio and Compressive Strength: Concrete shall have the following minimum properties:

Type of Work	Min 28-Day Compr. Strength (psi)	Max Size Aggregate (in)	Minimum Cement per cu yd (lbs)	Max W/C Ratio (by weight)
Structural Concrete:				
Roof, floor slabs, columns, walls and all other concrete items not specified elsewhere.	4,000	1	564	0.45
12-inch and thicker walls, slabs on grade and footings. (optional)	4,000	1-1/2	564	0.45
Pea Gravel Mix.	4,000	3/8	752	0.40
Other Concretes:				
Sitework concrete	3,000	1	470	0.50
Lean concrete	2,000	1	376	0.60

D. Adjustments to Mix Design: The mixes shall be changed whenever such change is necessary or desirable to secure the required strength, density, workability, and surface finish, and the CONTRACTOR shall be entitled to no additional compensation because of such changes.

2.6 CONSISTENCY

A. The quantity of water in a batch of concrete shall be just sufficient, with a normal mixing period, to produce a concrete which can be worked properly into place without segregation and which can be compacted by vibratory methods to give the desired density, impermeability, and smoothness of surface. The quantity of water shall be changed as necessary, with variations in the nature or moisture content of the aggregates, to maintain uniform production of a desired consistency. The consistency of the concrete in successive batches shall be determined by slump tests in accordance with ASTM C 143. The slumps shall be as follows:

Part of Work	Slump (in)
All concrete, unless indicated otherwise	3 inches plus or minus 1 inch
With high range water reducer added	7 inches plus or minus 2 inches
Pea gravel mix	7 inches plus or minus 2 inches
Ductbanks	5 inches plus or minus 1 inch

2.7 TRIAL BATCH AND LABORATORY TESTS

A. Before placing any concrete, a testing laboratory selected by the ENGINEER shall prepare a trial batch of each class of structural concrete, based on the preliminary concrete mixes submitted by the CONTRACTOR. During the trial batch the aggregate proportions may be adjusted by the testing laboratory using the two coarse aggregate size ranges to obtain the required properties. If one size range produces an acceptable mix, a second size range need not be used. Such adjustments will be considered refinements to the mix design and will not be the basis for extra compensation to the CONTRACTOR. All concrete shall conform to the requirements of this Section, whether the aggregate proportions are from the CONTRACTOR's preliminary mix design, or whether the proportions have been adjusted during the trial batch process. The trial batch shall be prepared using the aggregates, cement and admixture proposed for the project. The trial batch materials shall be of a quantity such that the testing laboratory can obtain 3 drying shrinkage, and 6 compression test specimens from each batch.

B. The determination of compressive strength will be made by testing 6-inch diameter by 12-inch high cylinders; made, cured and tested in accordance with ASTM C 192 and ASTM C 39. Three compression test cylinders will be tested at 7 days and 3 at 28 days. The average compressive strength for the 3 cylinders tested at 28 days for any given trial batch shall not be less than 125 percent of the specified compressive strength.

C. A sieve analysis of the combined aggregate for each trial batch shall be performed according to the requirements of ASTM C 136. Values shall be given for percent passing each sieve.

2.8 SHRINKAGE LIMITATION

A. The maximum concrete shrinkage for specimens cast in the laboratory from the trial batch, as measured at 21-day drying age or at 28-day drying age shall be 0.036 percent or 0.042 percent, respectively. Standard deviation will not be considered. The CONTRACTOR shall only use a mix design for construction that has first met the trial batch shrinkage requirements. Shrinkage limitations apply only to structural concrete.

B. The maximum concrete shrinkage for specimens cast in the field shall not exceed the trial batch maximum shrinkage requirement by more than 25 percent.

C. If the required shrinkage limitation is not met during construction, the CONTRACTOR shall take any or all of the following actions for securing the specified shrinkage requirements. These actions may include changing the source or aggregates, cement and/or admixtures; reducing water content; washing of aggregate to reduce fines; increasing the number of construction joints; modifying the curing requirements; or other actions designed to minimize shrinkage or the effects of shrinkage.

2.9 MEASUREMENT OF CEMENT AND AGGREGATE

A. The amount of cement and of each separate size of aggregate entering into each batch of concrete shall be determined by direct weighing equipment furnished by the CONTRACTOR and acceptable to the ENGINEER.

B. Weighing tolerances:

Material	Percent of Total Weight
Cement	1
Aggregates	3
Admixtures	3

2.10 MEASUREMENT OF WATER

A. The quantity of water entering the mixer shall be measured by a suitable water meter or other measuring device of a type acceptable to the ENGINEER and capable of measuring the water in variable amounts within a tolerance of one percent. The water feed control mechanism shall be capable of being locked in position so as to deliver constantly any specified amount of water to each batch of concrete. A positive quick-acting valve shall be used for a cut-off in the water line to the mixer. The operating mechanism shall prevent leakage when the valves are closed.

2.11 READY-MIXED CONCRETE

A. At the CONTRACTOR'S option, ready-mixed concrete may be used if it meets the requirements as to materials, batching, mixing, transporting, and placing as indicated herein and is in accordance with ASTM C 94, including the following supplementary requirements.

B. Ready-mixed concrete shall be delivered to the site of the work, and discharge shall be completed within one hour after the addition of the cement to the aggregates or before the drum has been revolved 250 revolutions, whichever is first.

C. Truck mixers shall be equipped with electrically-actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the resetable, recording type, and shall be mounted in the driver's cab. The counters shall be actuated at the time of starting mixers at mixing speeds.

D. Each batch of concrete shall be mixed in a truck mixer for not less than 70

revolutions of the drum or blades at the rate of rotation designated by the manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolution of mixing.

E. Truck mixers and their operation shall be such that the concrete throughout the mixed batch as discharged is within acceptable limits of uniformity with respect to consistency, mix, and grading. If slump tests taken at approximately the 1/4 and 3/4 points of the load during discharge give slumps differing by more than one inch when the required slump is 3 inches or less, or if they differ by more than 2 inches when the required slump is more than 3 inches, the mixer shall not be used on the work unless the causing condition is corrected and satisfactory performance is verified by additional slump tests. All mechanical details of the mixer, such as water measuring and discharge apparatus, condition of the blades, speed of rotation, general mechanical condition of the unit, and clearance of the drum, shall be checked before a further attempt to use the unit will be permitted.

F. Each batch of ready-mixed concrete delivered at the job site shall be accompanied by a delivery ticket furnished to the ENGINEER in accordance with the Paragraph in Part 1 entitled "Delivery Tickets."

G. The use of non-agitating equipment for transporting ready-mixed concrete will not be permitted. Combination truck and trailer equipment for transporting ready-mixed concrete will not be permitted. The quality and quantity of materials used in ready-mixed concrete and in batch aggregates shall be subject to continuous inspection at the batching plant by the ENGINEER.

PART 3 – EXECUTION

3.1 PROPORTIONING AND MIXING

A. Proportioning: Proportioning of the mix shall conform to the requirements of Chapter 3 "Proportioning" of ACI 301.

B. Mixing: Mixing shall conform to the requirements of Chapter 7 of said ACI 301 Specifications.

C. Slump: Slumps shall be as indicated herein.

D. Retempering: Retempering of concrete or mortar which has partially hardened shall not be permitted.

3.2 PREPARATION OF SURFACES FOR CONCRETING

A. General: Earth surfaces shall be thoroughly wetted by sprinkling prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.

B. Vapor Retarder Sheet

1. Sheet shall be installed under all on-grade building floor slabs of occupiable (non-hydraulic) structures and at other locations indicated.

2. Sand base shall be at least 2 inches thick within the foundation line after moistening and compaction by mechanical means. Sand surface shall be flat and level within a tolerance of plus 0 inches to minus 3/4-inch.

3. Place, protect, and repair defects in sheet according to ASTM E 1643 and the manufacturer's written instructions. Seams shall be lapped and sealed in accordance with ASTM E 1643.

4. Granular material above the sheet shall be moistened and compacted to 2 inches thickness within the same flatness criteria as the sand base.

C. Joints in Concrete: Concrete surfaces upon or against which concrete is to be placed, where the placement of the concrete has been stopped or interrupted so that, as determined by the ENGINEER, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of horizontal joints shall be given a compacted, roughened surface for good bonding. Except where the Drawings call for joint surfaces to be coated, the joint surfaces shall be cleaned of all laitance, loose or defective concrete, foreign material, and be roughened to a minimum 1/4-inch amplitude. Such cleaning and roughening shall be accomplished by hydroblasting or sandblasting (exposing aggregate) followed by thorough washing. All pools of water shall be removed from the surface of construction joints before the new concrete is placed.

D. After the surfaces have been prepared, all approximately horizontal construction joints shall be covered with a 6-inch lift of a pea gravel mix. The mix shall be placed and spread uniformly. Wall concrete shall follow immediately and shall be placed upon the fresh pea gravel mix.

E. Placing Interruptions: When placing of concrete is to be interrupted long enough for the concrete to take a set, the working face shall be given a shape by the use of forms or other means, that will secure proper union with subsequent work; provided that construction joints shall be made only where acceptable to the ENGINEER.

F. Embedded Items: No concrete shall be placed until all formwork, installation of parts to be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and accepted by the ENGINEER at least 4 hours before placement of concrete. All surfaces of forms and embedded items that have become encrusted with dried grout from previous work shall be cleaned before the surrounding or adjacent concrete is placed.

G. All inserts or other embedded items shall conform to the requirements herein.

H. All reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms at locations indicated on the Drawings or shown by shop

drawings and shall be acceptable to the ENGINEER before any concrete is placed. Accuracy of placement is the responsibility of the CONTRACTOR.

I. Casting New Concrete Against Old: Where concrete is to be cast against old concrete (any concrete which is greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by hydro-blasting or sandblasting (exposing aggregate). The joint surface shall be coated with an epoxy bonding agent unless indicated otherwise by the ENGINEER.

J. No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the WORK. No concrete shall be deposited underwater nor shall the CONTRACTOR allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, shall be subject to the review of the ENGINEER.

K. Corrosion Protection: Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2 inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.

L. Openings for pipes, inserts for pipe hangers and brackets, and anchors shall, where practicable, be provided during the placing of concrete.

M. Anchor bolts shall be accurately set and shall be maintained in position by templates while being embedded in concrete.

N. Cleaning: The surfaces of all metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.

3.3 HANDLING, TRANSPORTING, AND PLACING

A. General: Placing of concrete shall conform to the applicable requirements of Chapter 8 of ACI 301 and the requirements of this Section. No aluminum materials shall be used in conveying any concrete.

B. Non-Conforming Work or Materials: Concrete which during or before placing is found not to conform to the requirements indicated herein shall be rejected and immediately removed from the work. Concrete which is not placed in accordance with these Specifications or which is of inferior quality shall be removed and replaced.

C. Unauthorized Placement: No concrete shall be placed except in the presence of a duly authorized representative of the ENGINEER. The CONTRACTOR shall notify the ENGINEER in writing at least 24 hours in advance of placement of any

concrete.

D. Placement in Wall and Column Forms: Concrete shall not be dropped through reinforcement steel or into any deep form, nor shall concrete be placed in any form in such a manner as to leave accumulation of mortar on the form surfaces above the placed concrete. In such cases, means such as hoppers and, if necessary, vertical ducts of canvas, rubber, or metal shall be used for placing concrete in the forms in a manner that it may reach the place of final deposit without separation. In no case shall the free fall of concrete exceed 4 feet in walls and 8 feet in columns below the ends of ducts, chutes, or buggies. Concrete shall be uniformly distributed during the process of depositing and in no case after depositing shall any portion be displaced in the forms more than 6 feet in horizontal direction. Concrete in wall forms shall be deposited in uniform horizontal layers not deeper than 2 feet; and care shall be taken to avoid inclined layers or inclined construction joints except where such are required for sloping members. Each layer shall be placed while the previous layer is still soft. The rate of placing concrete in wall forms shall not exceed 5 feet of vertical rise per hour. Sufficient illumination shall be provided in the interior of all forms so that the concrete at the places of deposit is visible from the deck or runway.

E. Casting New Concrete Against Old: Epoxy adhesive bonding agent shall be applied to the old surfaces according to the manufacturer's written recommendations. This provision shall not apply to joints where waterstop is provided. See Section 03290 - Joints in Concrete.

F. Conveyor Belts and Chutes: All ends of chutes, hopper gates, and all other points of concrete discharge throughout the CONTRACTOR'S conveying, hoisting, and placing system shall be designed and arranged so that concrete passing from them will not fall separated into whatever receptacle immediately receives it. Conveyor belts, if used, shall be of a type acceptable to the ENGINEER. Chutes longer than 50 feet will not be permitted. Minimum slopes of chutes shall be such that concrete of the indicated consistency will readily flow in them. If a conveyor belt is used, it shall be wiped clean by a device operated in such a manner that none of the mortar adhering to the belt will be wasted. All conveyor belts and chutes shall be covered.

G. Placement in Slabs: Concrete placed in sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement. As the work progresses, the concrete shall be vibrated and carefully worked around the slab reinforcement, and the surface of the slab shall be screeded in an up-slope direction.

H. Temperature of Concrete: The temperature of concrete when it is being placed shall be not more than 90 degrees F nor less than 55 degrees F for sections less than 12 inches thick nor less than 50 degrees for all other sections. Concrete ingredients shall not be heated to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, from falling below the minimum temperature. When the temperature of the concrete is 85 degrees F or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes. If concrete is placed when the weather is

such that the temperature of the concrete would exceed 90 degrees F, the CONTRACTOR shall employ effective means, such as precooling of aggregates and mixing water using ice or placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90 degrees F. The CONTRACTOR shall be entitled to no additional compensation on account of the foregoing requirements.

I. Cold Weather Placement:

1. Placement of concrete shall conform to ACI 306.1 - Cold Weather Concreting, and the following.

2. Remove all snow, ice, and frost from the surfaces, including reinforcement, against which concrete is to be placed. Before beginning concrete placement, thaw the subgrade to a minimum depth of 6 inches. All reinforcement and embedded items shall be warmed to above 32 degrees F prior to concrete placement.

3. Maintain the concrete temperature above 50 degrees F for at least 3 days after placement.

3.4 PUMPING OF CONCRETE

A. General: If the pumped concrete does not produce satisfactory end results, the CONTRACTOR shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

B. Pumping Equipment: The pumping equipment shall have 2 cylinders and be designed to operate with one cylinder in case the other one is not functioning. In lieu of this requirement, the CONTRACTOR may have a standby pump on the site during pumping.

C. The minimum diameter of the hose conduits shall be in accordance with ACI 304.2R.

D. Pumping equipment and hose conduits that are not functioning properly shall be replaced.

E. Aluminum conduits for conveying the concrete shall not be permitted.

F. Field Control: Concrete samples for slump, air content, and test cylinders will be taken at the placement end of the hose.

3.5 ORDER OF PLACING CONCRETE

A. The order of placing concrete in all parts of the WORK shall be acceptable to the ENGINEER. In order to minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints at the indicated locations. The placing of units shall be done by placing alternate units in a manner such that each unit placed shall have cured at least 5 days for hydraulic structures and 2 days for

all other structures before the contiguous unit or units are placed, except that the corner sections of vertical walls shall not be placed until the 2 adjacent wall panels have cured at least 10 days for hydraulic structures and 4 days for all other structures.

B. The surface of the concrete shall be level whenever a run of concrete is stopped. To insure a level, straight joint on the exposed surface of walls, a wood strip at least 3/4-inch thick shall be tacked to the forms on these surfaces. The concrete shall be carried about 1/2-inch above the underside of the strip. About one hour after the concrete is placed, the strip shall be removed and any irregularities in the edge formed by the strip shall be leveled with a trowel and all laitance shall be removed.

3.6 TAMPING AND VIBRATING

A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted, throughout the entire depth of the layer which is being consolidated, into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete. Vibrators shall be Group 3 per ACI 309, high speed power vibrators (8000 to 12,000 rpm) of an immersion type in sufficient number and with at least one standby unit as required. Group 2 vibrators may be used only at specific locations when accepted by the ENGINEER.

B. Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that all air and rock pockets have been eliminated. Where flat-strip type waterstops are placed horizontally, the concrete shall be worked under the waterstops by hand, making sure that all air and rock pockets have been eliminated. Concrete surrounding the waterstops shall be given additional vibration over and above that used for adjacent concrete placement to assure complete embedment of the waterstops in the concrete.

C. Concrete in walls shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and closes snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the required results within 15 minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall not contact the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents.

3.7 FINISHING CONCRETE SURFACES

A. General: Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness of any kind, and shall present a finished, smooth, continuous hard surface. Allowable deviations from plumb or level and from the alignment, profiles, and dimensions shown are defined as tolerances and are indicated in Part 1,

above. These tolerances are to be distinguished from irregularities in finish as described herein. Aluminum finishing tools shall not be used.

B. Formed Surfaces: No treatment is required after form removal except for curing, repair of defective concrete, and treatment of surface defects. Where architectural finish is required, it shall be as indicated. Surface holes larger than 1/2-inch in diameter or deeper than 1/4-inch are defined as surface defects in basins and exposed walls.

C. Unformed Surfaces: After proper and adequate vibration and tamping, all unformed top surfaces of slabs, floors, walls, and curbs shall be brought to a uniform surface with suitable tools. Immediately after the concrete has been screeded, it shall be treated with a liquid evaporation retardant. The retardant shall be used again after each work operation as necessary to prevent drying shrinkage cracks. The classes of finish specified for unformed concrete surfaces are designated and defined as follows:

1. Finish U1 - Sufficient leveling and screeding to produce an even, uniform surface with surface irregularities not to exceed 3/8-inch. No further special finish is required.

2. Finish U2 - After sufficient stiffening of the screeded concrete, surfaces shall be float finished with wood or metal floats or with a finishing machine using float blades. Excessive floating of surfaces while the concrete is plastic and dusting of dry cement and sand on the concrete surface to absorb excess moisture will not be permitted. Floating shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Surface irregularities shall not exceed 1/4-inch. Joints and edges shall be tooled where indicated or as determined by the ENGINEER.

3. Finish U3 - After the finish U2 surface has hardened sufficiently to prevent excess of fine material from being drawn to the surface, steel troweling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense, uniform surface free from blemishes, ripples, and trowel marks. The finish shall be smooth and free of all irregularities.

4. Finish U4 - Trowel the Finish U3 surface to remove local depressions or high points. In addition, the surface shall be given a light hairbroom finish with brooming perpendicular to drainage unless otherwise indicated. The resulting surface shall be rough enough to provide a nonskid finish.

D. Unformed surfaces shall be finished according to the following schedule:

UNFORMED SURFACE FINISH SCHEDULE

Area	Finish
Grade slabs and foundations to be covered with concrete or fill material	U1

Floors to be covered with grouted tile or topping grout	U2
Water bearing slabs with slopes 10 percent and less	U3
Water bearing slabs with slopes greater than 10 percent	U4
Slabs not water bearing	U4
Slabs to be covered with built-up roofing	U2
Interior slabs and floors to receive architectural finish	U3
Top surface of walls	U3

3.8 ARCHITECTURAL FINISH

A. General: Architectural finishes shall be provided only where specifically indicated on the Drawings. In all other locations, the paragraph entitled Finishing Concrete Surfaces, shall apply.

1. Immediately after the forms have been stripped, the concrete surface shall be inspected and any poor joints, voids, rock pockets, or other defective areas shall be repaired and all form-tie holes filled as indicated herein.

2. Architectural finishes shall not be applied until the concrete surface has been repaired as required and the concrete has cured at least 14 days.

3. All architecturally treated concrete surfaces shall conform to the accepted sample in texture, color, and quality. It shall be the CONTRACTOR's responsibility to maintain and protect the concrete finish.

B. Smooth Concrete Finish

1. The concrete surface shall be wetted, and a grout shall be applied with a brush. The grout shall be made by mixing one part portland cement and one part of fine sand that will pass a No. 16 sieve with sufficient water to give it the consistency of thick paint. The cement used in said grout shall be 1/2 gray and 1/2 white portland cement, or other proportion as determined by the ENGINEER. White portland cement shall be Atlas white, or equal. Calcium chloride at 5 percent by volume of the cement shall be used in the brush coat. The freshly applied grout shall be vigorously rubbed into the concrete surface with a wood float filling all small air holes. After all the surface grout had been removed with a steel trowel, the surface shall be allowed to dry and, when dry, shall be vigorously rubbed with burlap to remove completely all surface grout so that there is no visible paint-like film of grout on the concrete. The entire cleaning operation for any area shall be completed the day it is started, and no grout shall be left on the surface overnight.

2. Cleaning operations for any given day shall be terminated at panel joints. It is required that the various operations be carefully timed to secure the desired effect which is a light-colored concrete surface of uniform color and texture without any appearance of a paint or grout film.

3. In the event that improper manipulation results in an inferior finish, the CONTRACTOR shall rub such inferior areas with carborundum bricks.

4. Before beginning any of the final treatment on exposed surfaces, the CONTRACTOR shall treat in a satisfactory manner a trial area of at least 200 square feet in some inconspicuous place selected by the ENGINEER and shall preserve said trial area undisturbed until the completion of the job.

3.9 CURING AND DAMPPROOFING

A. General: All concrete shall be cured for not less than 7 days after placing, in accordance with the methods indicated below for the different parts of the WORK.

Surface to be Cured or Dampproofed	Method
Unstripped forms	1
Wall sections with forms removed	6
Construction joints between footings and walls, and between floor slab and columns	2
Encasement concrete and thrust blocks	3
All concrete surfaces not specifically indicated in this Paragraph	4
Floor slabs on grade in hydraulic structures	5
Slabs not on grade	6

B. Method 1: Wooden forms shall be wetted immediately after concrete has been placed and shall be kept wet with water until removal. If steel forms are used the exposed concrete surfaces shall be kept continuously wet until the forms are removed. If forms are removed within 7 days of placing the concrete, curing shall be continued in accordance with Method 6 below.

C. Method 2: The surface shall be covered with burlap mats which shall be kept wet with water for the duration of the curing period, until the concrete in the walls has been placed. No curing compound shall be applied to surfaces cured under Method 2.

D. Method 3: The surface shall be covered with moist earth not less than 4 hours nor

more than 24 hours after the concrete is placed. Earthwork operations that may damage the concrete shall not begin until at least 7 days after placement of concrete.

E. Method 4: The surface shall be sprayed with a liquid curing compound.

1. It shall be applied in accordance with the manufacturer's printed instructions at a maximum coverage rate of 200 square feet per gallon and in such a manner as to cover the surface with a uniform film which will seal thoroughly.

2. Where the curing compound method is used, care shall be exercised to avoid damage to the seal during the 7-day curing period. If the seal is damaged or broken before the expiration of the curing period, the break shall be repaired immediately by the application of additional curing compound over the damaged portion.

3. Wherever curing compound has been applied by mistake to surfaces against which concrete subsequently is to be placed and to which it is to adhere, compound shall be entirely removed by wet sandblasting just prior to the placing of new concrete.

4. Curing compound shall be applied as soon as the concrete has hardened enough to prevent marring on unformed surfaces and within 2 hours after removal of forms. Repairs to formed surfaces shall be made within the 2-hour period; provided, however, that any such repairs which cannot be made within the said 2-hour period shall be delayed until after the curing compound has been applied. When repairs are to be made to an area on which curing compound has been applied, the area involved shall first be wet-sandblasted to remove the curing compound.

5. At all locations where concrete is placed adjacent to a panel which has been coated with curing compound, the panel shall have curing compound reapplied to an area within 6 feet of the joint and to any other location where the curing membrane has been disturbed.

6. Prior to final acceptance of the WORK, all visible traces of curing compound shall be removed from all surfaces in such a manner that does not damage the surface finish.

F. Method 5:

1. Until the concrete surface is covered with curing compound, the entire surface shall be kept damp by applying water using nozzles that atomize the flow so that the surface is not marred or washed. The concrete shall be given a coat of curing compound in accordance with Method 4 above. Not less than one hour nor more than 4 hours after the curing compound has been applied, the surface shall be wetted with water delivered through a fog nozzle, and concrete-curing blankets shall be placed on the slabs. The curing blankets shall be polyethylene sheet, polyethylene-coated waterproof paper sheeting, or polyethylene-coated burlap. The blankets shall be laid with the

edges butted together and with the joints between strips sealed with 2-inch wide strips of sealing tape or with edges lapped not less than 3 inches and fastened together with a waterproof cement to form a continuous watertight joint.

2. The curing blankets shall be left in place during the 7-day curing period and shall not be removed until after concrete for adjacent work has been placed. If the curing blankets become torn or otherwise ineffective, the CONTRACTOR shall replace damaged sections. During the first 3 days of the curing period, no traffic of any nature and no depositing, temporary or otherwise, of any materials shall be permitted on the curing blankets. During the remainder of the curing period, foot traffic and temporary depositing of materials that impose light pressure will be permitted only on top of plywood sheets 5/8-inch minimum thickness, laid over the curing blanket. The CONTRACTOR shall add water under the curing blanket as often as necessary to maintain damp concrete surfaces at all times.

G. Method 6: This method applies to both walls and slabs.

1. The concrete shall be kept continuously wet by the application of water for a minimum period of at least 7 consecutive days beginning immediately after the concrete has reached final set or forms have been removed.

2. Until the concrete surface is covered with the curing medium, the entire surface shall be kept damp by applying water using nozzles that atomize the flow so that the surface is not marred or washed.

3. Heavy curing mats shall be used as a curing medium to retain the moisture during the curing period. The curing medium shall be weighted or otherwise held substantially in contact with the concrete surface to prevent being dislodged by wind or any other causes. All edges shall be continuously held in place.

4. The curing blankets and concrete shall be kept continuously wet by the use of sprinklers or other means both during and after normal working hours.

5. Immediately after the application of water has terminated at the end of the curing period, the curing medium shall be removed, any dry spots shall be rewetted, and curing compound shall be immediately applied in accordance with Method 4 above.

6. The CONTRACTOR shall dispose of excess water from the curing operation to avoid damage to the work.

H. Dampproofing

1. The exterior surface of all buried roof slabs shall be dampproofed as follows.

2. Immediately after completion of curing the surface shall be sprayed with a dampproofing agent consisting of an asphalt emulsion. Application shall be in

2 coats. The first coat shall be diluted to □ strength by the addition of water and shall be sprayed on so as to provide a maximum coverage rate of 100 square feet per gallon of dilute solution. The second coat shall consist of an application of the undiluted material, and shall be sprayed on so as to provide a maximum coverage rate of 100 square feet per gallon. Dampproofing material shall be as indicated above.

3. As soon as the material has taken an initial set, the entire area thus coated shall be coated with whitewash. Any formula for mixing the whitewash may be used if it produces a uniformly coated white surface and remains until placing of the backfill. If the whitewash fails to remain on the surface until the backfill is placed, the CONTRACTOR shall apply additional whitewash.

3.10 PROTECTION

A. The CONTRACTOR shall protect all concrete against injury until final acceptance.

B. Fresh concrete shall be protected from damage due to rain, hail, sleet, or snow. The CONTRACTOR shall provide such protection while the concrete is still plastic and whenever precipitation is imminent or occurring.

3.11 CURING IN COLD WEATHER

A. Water curing of concrete may be reduced to 6 days during periods when the mean daily temperature in the vicinity of the Site is less than 40 degrees F; provided that, during the prescribed period of water curing, when temperatures are such that concrete surfaces may freeze, water curing shall be temporarily discontinued.

B. Concrete cured by an application of curing compound will require no additional protection from freezing if the protection at 50 degrees F for 72 hours is obtained by means of approved insulation in contact with the forms or concrete surfaces; otherwise the concrete shall be protected against freezing temperatures for 72 hours immediately following 72 hours protection at 50 degrees F. Concrete cured by water shall be protected against freezing temperatures for 3 days immediately following the 72 hours of protection at 50 degrees F.

C. Discontinuance of protection against freezing temperatures shall be such that the drop in temperature of any portion of the concrete will be gradual and will not exceed 40 degrees F in 24 hours. In the spring, when the mean daily temperature rises above 40 degrees F for more than 3 successive days, the specified 72-hour protection at a temperature not lower than 50 degrees F may be discontinued for as long as the mean daily temperature remains above 40 degrees F; provided, that the concrete shall be protected against freezing temperatures for not less than 48 hours after placement.

D. Where artificial heat is employed, special care shall be taken to prevent the concrete from drying. Use of unvented heaters will be permitted only when unformed surfaces of concrete adjacent to the heaters are protected for the first 24 hours from an excessive carbon dioxide atmosphere by application of curing compound; provided, that the use of curing compound for such surfaces is

otherwise permitted by these Specifications.

3.12 TREATMENT OF SURFACE DEFECTS

A. As soon as forms are removed, all exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the ENGINEER. In no case will extensive patching of honeycombed concrete be permitted. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall be repaired as indicated below. Concrete containing extensive voids, holes, honeycombing, or similar depression defects shall be completely removed and replaced. Repairs and replacements shall be performed promptly.

B. Defective surfaces to be repaired shall be cut back from trueline a minimum depth of 1/2-inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of all laitance or soft material, plus not less than 1/32-inch depth of the surface film from all hard portions by means of an efficient sandblast. After cutting and sandblasting, the surface shall be wetted sufficiently in advance of shooting with shotcrete or with cement mortar so that while the repair material is being applied, the surfaces underneath will remain moist but not so wet as to overcome the suction upon which a good bond depends. The material used for repair proposed shall consist of a mixture of one sack of cement to 3 cubic feet of sand. For exposed walls, the cement shall contain such a proportion of Atlas white portland cement as is required to make the color of the patch match the color of the surrounding concrete.

C. Holes left by tie-rod cones shall be reamed with suitable toothed reamers so as to leave the surfaces of the holes clean and rough. Holes then shall be repaired in an approved manner with dry-packed cement grout. Holes left by form-tying devices having a rectangular cross-section and other imperfections having a depth greater than their least surface dimension shall not be reamed but shall be repaired in an approved manner with dry-packed cement grout.

D. All repairs shall be built up and shaped in such a manner that the completed work will conform to the requirements of this Section, as applicable, using approved methods which will not disturb the bond, cause sagging, or cause horizontal fractures. Surfaces of repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.

3.13 PATCHING HOLES IN CONCRETE

A. Patching Small Holes:

1. Holes which are less than 12 inches in the least dimension and extend completely through concrete members shall be filled.

2. Small holes in members which are water-bearing or in contact with soil or

other fill material shall be filled with non-shrink grout. Where a face of the member is exposed to view, the non-shrink grout shall be held back 2 inches from the finished surface. The remaining 2 inches shall then be patched according to the Paragraph entitled "Treatment of Surface Defects."

3. Small holes through all other concrete members shall be filled with non-shrink grout, with exposed faces treated as above.

B. Patching Large Holes:

1. Holes which are larger than 12 inches in the least dimension shall have a keyway chipped into the edge of the opening all around, unless a formed keyway exists. The holes shall then be filled with concrete as indicated herein.

2. Holes which are larger than 24 inches in the least dimension and which do not have reinforcing steel extending from the existing concrete, shall have reinforcing steel set in grout in drilled holes. The reinforcing added shall match the reinforcing in the existing wall unless indicated otherwise.

3. Large holes in members which are water bearing or in contact with soil or other fill shall have a bentonite type waterstop material placed around the perimeter of the hole in accordance with Section 03290 - Joints in Concrete, unless there is an existing waterstop in place.

3.14 CARE AND REPAIR OF CONCRETE

A. The CONTRACTOR shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed WORK, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete.

3.15 Not Used.

- END OF SECTION -

SECTION 03410 -- PRECAST CONCRETE VAULTS

PART 1 - GENERAL

1.1. THE REQUIREMENT

A. The CONTRACTOR shall provide the precast concrete work in accordance with the Contract Documents.

B. This Section covers the design, fabrication, delivery and installation of all precast concrete units, including connections.

1.2. CODES AND STANDARDS

A. Commercial Standards

ANSI/ACI 315	Concrete Reinforcement
ANSI/ACI 318	Concrete Construction
ANSI/AWS A5.4	Welding Rods and Electrodes
AWS B2.1	
ANSI/AWS D1.1	Welding and Cutting
ANSI/AWS D1.4	Welding and Cutting
ASTM A 184	Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A 185	Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement
ASTM A 193	Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 194	Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
ASTM A 351	Steel Castings, Austenitic, for High- Temperature Service
ASTM A 497	Welded Deformed Steel Wire Fabric for Concrete Reinforcement
ASTM A 580	Stainless and Heat-Resisting Steel Wire
ASTM A 615	Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 666	Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar for Structural Applications
ASTM A 775	Epoxy-Coated Reinforcing Steel Bars
ASTM C 33	Concrete Aggregates

ASTM C 67	Method for Sampling and Testing Brick and Structural Clay Tile
ASTM C 127	Test Method for Specific Gravity and Absorption of Coarse Aggregate
ASTM C 128	Test Method for Specific Gravity and Absorption of Fine Aggregate
ASTM C 150	Portland Cement
ASTM C 173	Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 204	Test Method for Fineness of Portland Cement by Air Permeability Apparatus
ASTM C 231	Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	Air-Entraining Admixtures for Concrete
ASTM C 311	Method for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C 494	Test Method for Shear Fatigue of Sandwich Core Materials
ASTM D 2240	Test Method for Rubber Property --Durometer Hardness
AWS D12.1	
PCI MNL-116	
PCI MNL-117	
PCI MNL-121	

1.3. CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall submit Shop Drawings for all precast concrete items in accordance with Section 01300 - Contractor Submittals. Drawings shall show all dimensions, location and type of lifting inserts, and details of reinforcement and joints.

B. For all precast items that are manufactured, the CONTRACTOR shall also submit a list of the design criteria used by the manufacturer.

B. The CONTRACTOR shall submit approved ICBO reports for all lifting inserts, showing allowable design loads on the inserts.

C. **Mix Design:** Prior to beginning the WORK, the CONTRACTOR shall submit to the ENGINEER, for review, preliminary concrete mix designs which shall show the proportions and gradations of all materials proposed for each class and type of concrete specified herein in accordance with Division 1. The mix designs shall be designed by an

independent testing laboratory acceptable to the ENGINEER. All costs related to such mix design shall be the CONTRACTOR's responsibility.

E Verification of compressive strength shall be submitted in accordance with Division 1. Such verification may be laboratory trial batch test results with a minimum of three test cylinders or a series of production compression tests with a minimum of 20 sets of test data which fall within the evaluation and acceptance criteria specified herein. Such tests must have been made within the previous two years on the identical concrete mix submitted.

1.4 QUALITY ASSURANCE

A. Tests on component materials and for compressive strength of concrete will be performed as specified herein. Test for determining slump will be in accordance with the requirements of ASTM C 143. The cost of all laboratory tests on cement, aggregates, and concrete, will be borne by the OWNER. However, the CONTRACTOR shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications.

B. Evaluation and Acceptance of Concrete

1. Evaluation and acceptance of the compressive strength of concrete shall be according to the requirements of ACI 318, Chapter 4 "Concrete Quality," and as specified herein.

2. A statistical analysis of compression test results will be performed according to the requirements ACI 214. The standard deviation of the test results shall not exceed 640 psi.

3. When the standard deviation of the test results exceed 640 psi, the average strength for which the mix is designed shall be increased by an amount necessary to satisfy the statistical requirement that the probability of any test being more than 500 psi below or the average of any 3 consecutive tests being below the specified compressive strength is 1 in 100. The required average strength shall be calculated by Criterion No.3 of ACI 214 using the actual standard of deviation.

4. All concrete that fails to meet the ACI requirements and these specifications shall not be used and removal and replacement shall be at the cost of the CONTRACTOR.

C. **Compression Tests:** Compression tests shall be made in accordance with Section 03300 - Cast-In-Place Concrete.

1.5. DEFINITIONS

A. In these Specifications, where the terms "Precast Concrete" and "Precast Concrete Specialties" are used, they shall have equivalent meaning.

PART 2 - PRODUCTS

2.1 MANUFACTURED ITEMS

A. Miscellaneous precast vaults (including electrical manholes, pull boxes, and meter boxes)

1. Size: Vault dimensions shall be as required by Drawings.

2. Material: Concrete used for manufactured vaults shall have a minimum 3000 psi compressive strength.

3. Covers: Unless indicated otherwise, vaults shall have concrete covers with minimum 30-inch diameter galvanized steel lids, which are bolted to galvanized steel frames with stainless steel bolts. The frames and lids shall be provided by the vault manufacturer. Covers shall have lifting handles. When leveling bolts are used to set the vault top sections, the CONTRACTOR shall ensure that the load on the vault will be transferred through the mortar to the vault, and will not be carried by the leveling bolts.

4. Loading: Where vaults are in areas that may be subjected to vehicular traffic; they shall be designed for H-20 traffic loading. In other areas, they shall be designed for a vertical live load of 300 psf. Lateral loads on all vault walls shall be as follows;

   h = depth of fill:

   Lateral surcharge soil pressures (triangular): 90 x h (psf)

   Lateral surcharge soil pressure: 200 psf

   Increase in soil pressure due to seismic: 25 psf (uniform)

   Seismic acceleration applied to vault dead loads: 0.27 x gravity

   The worst load case of static plus seismic or static plus surcharge shall be used for design.

5. Mechanical Details: Piping, electrical, and other details shall be as required by the Contract Documents.

2.2. PREFORMED JOINT SEALANT

A. The joint sealing compound shall be in accordance with Section 7920.

2.3. MORTAR

A. Mortar used between the sections of precast concrete manholes and vaults shall be as recommended by the precast manufacturer.

B. Non-shrink grout shall be as specified in the Section 03315 - Grout.

PART 3 - EXECUTION

3.1 MANUFACTURED ITEMS

A. **Pull Boxes, Electrical Manholes, Vaults, and Meter Boxes:** The above mentioned precast items shall be installed in accordance with the manufacturer's recommendations, unless otherwise required by the Drawings.

B. **Connections:** Connections to manufactured precast items shall be made by casting sections of pipe into the items, using non-shrink grout as shown on the Drawings, and/or using an approved resilient connector.

-END OF SECTION-

Section 3800

Precast Concrete Landscape Wall

Part 1: GENERAL

1.01 Description

A. Work shall consist of designing, furnishing and construction of a landscape wall system in accordance with these specifications and in reasonably close conformity with the lines, grades, design and dimensions shown on the plans.

B. Work includes preparing foundation soil, furnishing and installing leveling pad, unit facing system, unit drainage fill and reinforced backfill to the lines and grades shown on the construction drawings.

C. Work incudes furnishing and installing geogrid soil reinforcement of the type, size, location and lengths designated on the construction drawings.

1.02 Related Sections

A. Section 31 00 00 – Earthwork

1.03 Reference Documents

A. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M 252 Corrugated Polyethylene Drainage Pipe
2. AASHTO M 288 Geotextile Specification for Highway Applications

B. American Society for Testing and Materials (ASTM)

1. ASTM C140 Sampling and Testing Concrete Masonry Units
2. ASTM C1372 Specification for Dry-Cast Segmental Retaining Wall Units
3. ASTM D442 Particle Size Analysis of Soils
4. ASTM D698 Laboratory Compaction Characteristics of Soil – Standard Effort
5. ASTM D1556 Standard Test Method for Density and Unit Weight of Soil In Place by the Sand Cone Method
6. ASTM D1557 Laboratory Compaction Characteristics of Soil – Modified Effort
7. ASTM D2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
8. ASTM D2922 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
9. ASTM D3034 Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer pipe and Fittings
10. ASTM D4318 Liquid Limit, Plastic Limit and Plasticity Index of Soils
11. ASTM D4475 Horizontal Shear Strength of Pultruded Reinforced Plastic Rods
12. ASTM D4476 Flexural Properties of Fiber Reinforced Pultruded Plastic Rods
13. ASTM D4595 Standard Test Method for Tensile Properties of Geotextiles by Wide-Width Strip Method
14. ASTM D4873 Standard Guide for Identification, Storage and Handling of Geosynthetics
15. ASTM D5262 Standard Test Method for Evaluating the Unconfined Tension Creep Behavior of Geosynthetics
16. ASTM D5321 Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method

17. ASTM D5818 Standard Practice for Obtaining Samples of Geosynthetics from a Test Section for Assessment of Installation Damage
18. ASTM D6637 Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Method
19. ASTM D6638 Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units
20. ASTM D6706 Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil
21. ASTM D6916 Standard Test Method for Determining the Shear Strength Between Segmental Concrete Units

C. National Concrete Masonry Association (NCMA)

1. NCMA SRWU-1 Test Method for Determining Connection Strength of SRW
2. NCMA SRWU-2 Test Method for Determining Shear Strength of SRW

1.04 Definitions

A. Precast Masonry Unit – a dry-stacked concrete retaining wall unit machine made from Portland cement, water, aggregates.

B. Unit Drainage Fill – drainage aggregate that is placed within and immediately behind the concrete units.

C. Reinforced Backfill – compacted soil that is placed within the reinforced soil volume as outlined on the plans.

D. Retained Soil – the soil mass behind the reinforced backfill.

E. Foundation Soil – the soil mass below the leveling pad and reinforced backfill.

F. Leveling Pad – crushed stone, sand and gravel or unreinforced concrete material placed to provide a level surface for placement of the concrete units.

G. Geosynthetic Reinforcement – polymeric material designed specifically for soil reinforcement.

1.05 Submittals and Certification

A. Contractor shall submit a Manufacturer’s certification, prior to the start of work, that the retaining wall system components meet the requirements of this specification.

1.06 Quality Assurance

A. Owner shall/may provide quality assurance inspection and testing during earthwork and wall construction operations. Contractor shall provide all quality control testing and inspection not provided by the owner. Owner’s quality assurance program does not relieve the contractor of responsibility for quality control and wall performance.

1.07 Delivery Handling and Storage

A. Contractor shall check all materials upon delivery to assure that the proper type, grade, color, and certification have been received.

B. Contractor shall protect all materials from damage due to jobsite conditions and in accordance with manufacturer's recommendations. Damaged materials shall not be incorporated into the work.

PART 2: PRODUCTS

2.01 Concrete Landscape Wall Units

A. Precast Concrete Masonry Units shall be Keystone Compac III retaining wall units or approved equal, and shall conform to the following architectural requirements

1. Face color - concrete gray, unless otherwise specified. The Owner may specify standard manufacturers' color.
2. Tri-plane or Straight Face finish - hard split in angular tri-plane or straight face configuration. Other face finishes will not be allowed without written approval of Owner.
3. Bond configuration - running with bonds nominally located at midpoint in vertically adjacent units.
4. Exposed surfaces of units shall be free of chips, cracks or other imperfections when viewed from a distance of 20 feet (6 m) under diffused lighting.

B. Concrete units shall conform to the requirements of ASTM C1372 - Standard Specifications for Segmental Retaining Wall Units.

C. Concrete units shall conform to the following structural and geometric requirements measured in accordance with ASTM C140 Sampling and Testing Concrete Masonry Units:

1. Compressive strength: ≥ 3000 psi (21 MPa).
2. Absorption: ≤ 8 % for standard weight aggregates.
3. Dimensional tolerances: ± 1/8" (3 mm) from nominal unit dimensions not including rough split face.
4. Unit Size: 8" (203 mm) (H) x 18" (457 mm) (W) x 12" (304 mm)(D) minimum.

D. Precast concrete units shall conform to the following constructability requirements:

1. Vertical setback: 1/8 inch (3 mm) ± per course (near vertical) or 1 1/8 inch (28 mm) + per course, per the design.
2. Alignment and grid attachment mechanism - fiberglass pins, two per unit.
3. Maximum horizontal gap between erected units shall be ≤ 1/2 inch (13 mm).

2.02 Shear and Reinforcement Pin Connectors

A. Shear and reinforcement pin connectors shall be 1/2-inch (12 mm) diameter thermoset isopthalic polyester resin pultruded fiberglass reinforcement rods to provide connection between vertically and horizontally adjacent units and geosynthetic reinforcement, with the following requirements:

1. Flexural Strength in accordance with ASTM D4476: 128,000 psi (882 MPa) minimum.
2. Short Beam Shear in accordance with ASTM D4475: 6,400 psi (44 MPa) minimum.

B. Shear and reinforcement pin connectors shall be capable of holding the geogrid in the proper design position during grid pre-tensioning and backfilling.

2.03 Base Leveling Pad Material

A. Material shall consist of a compacted crushed stone base, sand and gravel or unreinforced concrete, as shown on the construction drawings.

2.04 Unit Drainage Fill

A. Unit drainage fill shall consist of clean 1 inch (25 mm) minus crushed stone or crushed gravel meeting the following gradation tested in accordance with ASTM D-422:

Sieve Size	Percent Passing
1 inch (25 mm)	100
3/4-inch (19mm)	75 – 100
No. 4 (4.75 mm)	0 – 10
No. 50 (300 um)	0 - 5

B. Drainage fill shall be placed within the cores of, between, and behind the units as indicated on the design drawings. Not less than 1.3 cubic foot (0.036 m^3), of drainage fill shall be used for each square foot (0.093 m^2) of wall face unless otherwise specified.

2.05 Reinforced Backfill

A. Reinforced backfill shall be free of debris and meet the following gradation tested in accordance with ASTM D-422:

Sieve Size	Percent Passing
1 1/2 inch (38 mm)	100
3/4-inch (19 mm)	75 – 100
No. 40 (425 um)	0 – 60
No. 200 (75 um)	0 – 35

Plasticity Index (PI) < 15 and Liquid Limit < 40, per ASTM D4318

B. The maximum aggregate size shall be limited to 3/4 inch (19 mm) unless installation damage tests have been performed to evaluate potential strength reductions to the geogrid design due to increased installation damage during construction.

C. Material can be site-excavated soils where the above requirements can be met. Soils not meeting the above criteria, including highly plastic clays and organic soils, shall not be used in the backfill or reinforced backfill soil mass.

D. Contractor shall submit reinforced fill sample and laboratory test results to the Architect/Engineer for approval, prior to the use of any proposed reinforced backfill material.

2.06 Drainage Pipe

A. If required, drainage pipe shall be perforated or slotted PVC pipe manufactured in accordance with ASTM D3034 or corrugated HDPE pipe manufactured in accordance with AASHTO M252.

2.07 Geotextile Filter Fabric

A. When required, geotextile filter fabric shall be a needle-punched nonwoven fabric that meets the requirements of AASHTO M288.

PART 3: EXECUTION

3.01 Excavation

A. Contractor shall excavate to the lines and grades shown on the construction drawings. The Owner or Contractors QA/QC representative shall inspect the excavation and test the foundation soils and approve prior to placement of the leveling pad material or fill soils. Any over-excavation required to remove unsuitable soils shall be oversized from the front of the leveling pad and back of the geogrid reinforcement.

B. Over-excavation and replacement of unsuitable soils and replacement with approved compacted fill will be compensated as agreed upon with the Owner.

3.02 Base Leveling Pad

A. Leveling pad material shall be placed to the lines and grades shown on the construction drawings to a minimum thickness of 6 inches (150 mm) and extend laterally a minimum of 6 inches in front and behind the Precast wall unit.

B. Soil leveling pad materials shall be compacted to a minimum of 95% of Standard Proctor density per ASTM D697 or 92% Modified Proctor density per ASTM D1557.

C. Leveling pad shall be prepared to insure full contact with the base surface of the concrete units.

3.03 Precast Unit Installation

A. First course of units shall be placed on the leveling pad at the appropriate line and grade. Alignment and level shall be checked in all directions and insure that all units are in full contact with the base and properly seated.

B. Place the front of units side-by-side. Do not leave gaps between adjacent units. Layout of corners and curves shall be in accordance with manufacturer’s recommendations.

C. Install shear/connecting pins per manufacturer’s recommendations.

D. Place and compact drainage fill within and behind wall units. Place and compact reinforced backfill soil behind drainage fill.

E. Maximum stacked vertical height of wall units, prior to drainage fill and backfill placement and compaction, shall not exceed three courses.

3.04 Cap Installation

A. Prior to placement of the cap units, the upper surface of the top course of wall units shall be cleaned of soil and any other material.

B. Cap units shall be adequately glued to the underlying wall units with an all-weather exterior construction adhesive.

3.05 As-built Construction Tolerances

A. Vertical alignment: ± 1.5 inches (40 mm) over any 10 foot (3 m) distance.

B. Wall batter: within 2 degrees of design batter. Overall wall batter shall be ≥ 0 degrees.

C. Horizontal alignment: ± 1.5 inches (40 mm) over any 10 foot (3 m) distance.

D. Corners and curves: ± 1 foot (300 mm) to theoretical location.

E. Maximum horizontal gap between erected units shall be ≤ 1/2 inch (13 mm).

3.06 Field Quality Control

A. Quality Assurance – The owner shall/may engage inspection and testing services, including independent laboratories, to provide quality assurance and testing services during construction. This does not relieve the Contractor from securing the necessary construction quality control testing.

B. Quality assurance should include foundation soil inspection and testing and verification of the geotechnical design parameters and verification that the contractor's quality control testing is adequate as a minimum. Quality assurance shall also include observation of the construction for general compliance with the design drawings and project specifications. Quality assurance is usually best performed by the site geotechnical engineer.

C. Quality Control – The Contractor shall engage independent inspection and testing services to perform the minimum quality control testing described in the retaining wall design plans and specifications. Only qualified and experienced technicians and engineers shall perform quality control testing and inspection services.

D. Quality control testing shall include soil and backfill testing to verify soil types and strengths, compaction and moisture conditions and verification that the retaining wall is being constructed in accordance with the design plans and specifications.

SECTION 09810 – WELDED STORAGE TANK COATING

PART 1 -- GENERAL

1.01 SPECIFICATION INTENT

A. It is the intent of this specification to set forth the standards and practices to accomplish painting, coating, ventilation, testing, disinfection, and all related work.

B. It is the intent of this specification to specify, list and delineate all areas to be coated and painted. An inadvertent omission to describe a surface will not exempt the Contractor from performing coating or painting of all areas intended for coating or paint application in accordance with the standards and practices set forth herein.

C. All labor, materials, rigging, application equipment, lighting, inspection devices, etc., and all related work shall be in accordance with the standards and practices set forth herein.

D. The Engineer's decision shall be final as to interpretation and/or conflict between any of the reference specifications and standards contained herein.

1.02 REFERENCE SPECIFICATIONS AND STANDARDS

A. Without limiting the general aspects or other requirements of these specifications, all activity, materials, equipment set forth herein shall conform to all city, municipal, county, regional, state, and federal laws, codes, action levels, ordinances, etc., governing the scope of activity set forth herein. Special consideration shall be given to standards of the American Water Works Association D102-21 Standards, National Sanitary Foundation, **San Joaquin Valley Air Pollution Control Distirct**, California OSHA, California EPA, the Steel Structure Painting Council, and the coating manufacturer's printed instructions.

B. The Contractor shall give all notices and comply with all laws, regulations, guidelines applicable to furnishing and performance of the project parameters set forth herein with due diligence given to emissions and disposal of solid, particulate, liquid, and/or gaseous matter. Except where otherwise expressly required by applicable laws, regulations and guidelines, neither the Owner, the Owner's Representative nor the Maker of this specification shall be responsible for monitoring Contractor's compliance with any laws, regulations, or guidelines. If Contractor observes that the specifications or drawings are at variance with any laws, regulations, or guidelines, Contractor shall give the Owner prompt written notice thereof, ***prior to bid***, and the Owner will address any necessary changes. If Contractor performs any work knowing or having reason to know that said work is contrary to such laws, regulation, or guidelines, and without such notice to the Owner or the Owner's Representative, the Contractor shall bear all costs, remedies and/or legal actions arising there from.

1.03 CONTRACTOR

A. The Contractor shall hold a valid, active status State Contractor's License pertaining to the activities specified. The Contractor shall have had ten (10) years of practical experience and successful history in all phases of the applications specified herein, including at least five (5) projects in California within the past five (5) years. Where applications of coating or paint is restricted by the Manufacturer to "certified", "approved", or "factory trained personnel", such approval is the burden of the Contractor at his expense, to obtain. Such approval must be obtained prior to bid date. Any bids submitted by Contractors not holding

current approval by the Manufacturer will not be accepted. Verification of past experience, referral, or required Manufacturer approval shall be substantiated in writing upon request.

1.04 SITE COATING PRE-WORK CONFERENCE

A. A conference shall be scheduled at least one (1) month prior to commencement of on-site coating application or activity by the Contractor. The Owner, Contractor, Engineer, and other persons requested by the Owner shall be present. The purpose of the meeting is to confirm project requirements, including but not limited to, allowable application conditions, testing procedures and equipment, surface preparation of welds, non-shop coated areas, and scratches, allowable duration in advance of surface preparation prior to coating, etc.

1.05 SUBMITTALS

A. Procedure: All pre job SUBMITTALS shall be delivered to the Owner far enough in advance of scheduled dates of installation to provide all required time for reviews, for securing necessary approvals, for possible revision and re-submittal, and for placing orders and securing delivery. Fifteen working days shall be allowed for review of SUBMITTALS. If requested, resubmit rejected SUBMITTALS in a timely manner. Resubmit as specified for initial submittal. Indicate any changes which have been made other than those requested in the first submittal.

B. Pre job SUBMITTALS: The pre job SUBMITTALS shall include four (4) each:

Detailed description of shop applied primer procedures and quality control measures,

coating material data sheets, coating material safety data sheets, thinner material safety data sheets, written description of ventilation system, written description of spent abrasive storage, and written description of waste disposal protocol.

C. Interim job SUBMITTALS: The interim job SUBMITTALS shall include four (4) each:

Copies of original spent abrasive TCLP test results written description of proposed disposal option. Provide color charts for exterior coatings. Provide three (3) color visualizer pdf's pictures of the Project tank for Owner selected colors.

D. Post job SUBMITTALS: The post job SUBMITTALS shall include four (4) each: Written verification of spent abrasive disposal site and date

1.06 QUALITY ASSURANCE

A. **General:** 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 accepted professional standards and are approved by the Engineer. Contractor shall provide all rigging, lighting, scaffolding, labor, etc. as deemed necessary by the Engineer to facilitate all inspection including the annual warranty inspection. Inspection and subsequent reporting does not constitute any form of guarantee or insurance with respect to the performance of the contractor or the coating system.

B. **Surface preparation (Steel):** Surface preparation will be based upon comparison with: the latest version of SSPC "Pictorial Surface Preparation Standards or Painting Steel Surfaces," ASTM Designation D220: "Standard Methods of Evaluating Degree of Rusting on Painted Steel Surfaces of New Steel Airblast Cleaned with Sand Abrasive," NACE Standard TM-01-70; and as described below. Anchor profile for prepared surfaces shall be measured by use of a non-destructive instrument such as a Keane-Tator Surface Profile

Comparator, Testex Press-O-Film System, or approved equal.

C. **Application:** No coating or paint shall be applied when: (1) the surrounding air or the temperature of the surface to be coated or painted is below 40 degrees F. (4.4 degrees C.); (2) surfaces are damp due to rain, snow, fog or mist; (3) the temperature is less than 5 degrees F. (2.78 degrees C.) above the dewpoint, and (D) 4 hours following surface preparation (assuming A, B, and C are not present). Factory applications can exceed the 4-hour prep-to-prime window if:

(a) The amount of area cleaned may be increased to that which can be prime coated within a 24-hour period provided feasibility tests are performed to demonstrate that the facility's controlled environment is conducive to maintaining ambient conditions such that rust back does not occur within a 30-hour period. Even if the 24-hour process is approved through the 30-hour feasibility test, areas that exhibit rust-back within the 24-hour period shall be recleaned prior to painting; and
(b) Ambient conditions shall be monitored and documented every 2 to 4 hours from the time of cleaning for 30 hours. At the end of 30 hours, the steel shall be examined for rust-back and compared with the same SSPC-VIS 1 photograph that was originally used, to determine if any change in appearance has occurred. If there is any evidence of visible rust-back or a change in appearance, the facility shall not be permitted to hold prepared, un-primed steel for 24 hours until changes to the facility are made and this 30-hour feasibility test is repeated with satisfactory results. If approved, the ambient conditions associated with the 30-hour feasibility test shall be maintained during the 24-hour holding period for the production work.

Dewpoint shall be measured by use of an instrument such as a Sling Psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychometric Tables. Specialty paints and coatings formulated for application in atmospheric conditions more severe than specified above shall be permitted only to those limits set forth in the Manufacturer's written recommendations, and as approved by Engineer. If the above adverse conditions are prevalent, coating or painting shall be delayed or postponed until conditions are favorable. Coating or painting shall be completed in time to permit the film sufficient drying time to prevent damage by atmospheric conditions.

F. **Inspection - General:** Contractor shall provide all testing equipment for quality control, including equipment calibration devices. Where destructive testing is deemed necessary, an instrument such as a Took Gage shall be used. Thickness of coatings and paints on all metal surfaces shall be checked with a non-destructive type thickness gauge. Coating integrity shall be tested with an approved inspection device. Holiday detection shall be performed prior to the application of aluminum or metallic finish coats. Holiday detectors shall not exceed the voltage recommended by the Manufacturer of the coating system. When utilizing "wet sponge" type detectors for film thickness between 10 and 20 mils (250 microns and 500 microns), a non-siding type wetting agent such as a Kodak Photo-Flow shall be added to the water prior to setting the detector sponge. When utilizing high voltage type detectors voltage shell be set to the closest setting above 100 X specified mils dry film thickness. All isolated pinholes and pinhole patterns shall be marked, repaired in accordance with the Manufacturer's recommendations and retested. No pinholes or other irregularities will be permitted in the interior coating system surfaces below the service line unless otherwise specified. All materials furnished and all work performed under the contract shall be subject to inspection by the Engineer. Such inspection may include mill, plant, and shop or field inspection as required.' The Engineer shall be permitted access to all parts of the work, including plants where materials or equipment

are manufactured or fabricated, and he shall be furnished with such materials, information and assistance by the Contractor and his subcontractors and suppliers as is required to make a complete and detailed inspection.

Work done in the absence of prescribed inspection may be required to be removed and replaced under proper inspection, and the entire cost of removal and replacement, including the cost of all materials which may be furnished by the Owner and used in the work thus removed, shall be borne by the Contractor, regardless of whether the work removed is found to be defective or not. Work shall not be covered up without the authority of the Engineer. If so covered without authority, the work, upon order of the Engineer, shall be uncovered to the extent required, and the Contractor similarly shall bear the entire cost of performing all the work and furnishing all the material necessary for the removal of the covering and its subsequent replacement, as directed and approved by the Engineer. Contractor shall provide a quality control program to ensure the coating applications are in conformance with the specifications and coating manufacturer's recommendations. Except as otherwise provided herein, the Owner shall retain and pay for third-party inspection of factory and site-applied coatings. The Engineer will make, or have made, such tests, as he deems necessary to insure that the work is being accomplished in accordance with the requirements of the contract. In the event such tests reveal non-compliance with the requirements of the contract, the Contractor shall bear the cost of such corrective measures deemed necessary by the Engineer, as well as the cost of subsequent retesting and associated inspection time.

G. **Inspection Devices:** Contractor shall furnish, until final acceptance of coating and painting, quality control and inspection devices of the highest quality and in good working condition for determination of coating conditions (e.g. humidity, steel and ambient temperatures, dew point, etc.), profile, and detection of holidays and measurement of dry-film thickness of coating and paint. The Contractor and/or Engineer shall also furnish National Institute of Standards certified thickness calibration plates to test accuracy of dry film thickness gage. All devices shall be made available for the Engineer's use at all times until final acceptance of application. Holiday detection devices shall be operated in the presence of/or by the Engineer. Acceptable devices for ferrous metal surfaces include, but are not limited to Tinker-Rasor Model M-1 holiday detector for coatings to 20 mils (500 microns) dry film thickness, and Positest unit for dry film thickness gauging. Non-ferrous metal surfaces shall be checked with an instrument such as an Elcometer "Eddy Current" Tester or De Felsko Model 252. Inspection devices shall be operated in accordance with the Manufacturer's instructions.

1.07 SAFETY AND HEALTH

General: Safety and health activities shall be in accordance with requirements of the latest revision of CAL-OSHA Regulations for Construction, the Manufacturer's printed instructions, appropriate technical bulletins, and manuals, including SSPC-Paint Application Guide No. 3. This section describes areas of the project warranting particular but not all-inclusive consideration. It is the responsibility of the contractor and his sub-contractors to conduct project operations in a safety manner with consideration to safety and illness prevention.

A. **Head and Face Protection and Respiratory Devices:** Equipment shall include protective helmets, which shall be worn by all persons while in the vicinity of the work. In addition, workers engaged in or near the work during abrasive blasting shall wear eye and face protection devices and air purifying, half-mask or mouthpiece respirator with appropriate filter. Barrier creams shall be used on any exposed areas of skin.

B. **Ventilation:** Where ventilation is used to control hazardous exposure, all equipment shall be explosion-proof. Ventilation shall reduce the concentration of air contaminant to the degree a hazard does not exist. Air circulation and exhausting of solvent vapors shall be continued until the coating has fully cured. It is essential that the solvent vapors released during and after application of coatings be removed form the tank. During coating application the capacity of ventilating fans shall be no less than recommended by the manufacturer of the coating and required by regulations of the enforcing agency. Continuous forced ventilation at the rate of at least one complete air change every 4 hours shall be provided for at least 48 hours after coating application is completed or until coating is completely cured in accordance with the manufacturer's recommendation. Tank or structure manway/s shall be kept open for an additional 7 days minimum. Air shall be exhausted form the lowest portions of the tank or structure with top openings kept open and clear. During abrasive blast operations nozzle operators shall wear air supplied helmets and all other persons exposed to abrasive blast dust shall wear filter type respirator and safety goggles or other personal protective equipment as required by local, state, and federal safety regulations. When coatings are applied inside an enclosed area such as a tank, all persons exposed to vapors shall wear appropriate respiration protection.

C. **Sound Levels:** Whenever the occupational noise exposure exceeds maximum allowable sound levels, the Contractor shall provide and require the use of approved ear protective devices.

D. **Illumination:** Adequate illumination shall be provided while work is in progress, including explosion-proof lights (guarded to prevent breakage) and electrical equipment. Whenever required by the Engineer the Contractor shall provide additional illumination and necessary supports to cover all areas to be inspected. The Engineer shall determine the level of illumination for inspection purposes. Lighting fixtures and flexible cords shall comply with the requirements of NFPA70 National Electric Code for the atmosphere in which they will be used

E. **Temporary Ladders and Scaffolding:** All temporary ladders and scaffolding shall conform to applicable safety requirements. They shall be erected where requested by the Engineer to facilitate inspection, and be moved by the Contractor to locations requested by the Engineer.

F. **Grounding:** All electric cables, motors, and lighting equipment must be of an approved explosion-proof type. Ground all structures and equipment. No electric junction boxes should be permitted inside the confined area or tank. Droplights used by workmen must also be explosion-proof. Workmen must be instructed not to cut or stretch electric cable because sparks will be generated if the cable separates. Within he hazardous area, all equipment, tools, clothes, and shoes must be of a non-sparking type. Precautions shall be taken during abrasive blast cleaning operations to prevent the accumulation of static electricity. All abrasive blasting equipment, coating application equipment including hoses shall be grounded to meet appropriate regulatory requirements.

G. **Toxic Atmospheres:** Solvent vapors shall be removed from the confined area or vessel by suction. Air shall not be forced from the outside into the enclosure. Solvents and atomized coating particles are highly toxic, are heavier than air and, therefore, tend to settle and concentrate in the lowest and/or coolest parts of the structure. Care shall be taken to remove toxic vapors and atomized particles with special attention given to the lowest and coolest areas. Most protective coating contains solvents and other raw materials that can be health hazards if appropriate safety precautions are not taken.

Personal exposure to solvent vapors shall be maintained below the permissible exposure limit (PEL). Contractor shall follow local. State, and federal safety regulations and applicable hazard warnings information on container labels, manufacturer's literature, and material safety data sheets (MSDS) prior to storage, handling and use.

H. **Fire Hazard:** Flammable, volatile solvents in paints and coatings constitute a major hazard with regard to fire and explosions where flame or spark exposure is possible. All flames, smoking, and welding, etc. are strictly prohibited. Fire abatement devices shall be readily available and in operating condition.

1.08 PUBLIC CONVENIENCE AND PROPERTY PROTECTION

A. The Contractor shall at all times conduct his work so as to assure the least possible inconvenience the general public and adequate protection of persons and property in the vicinity of the work. Attention shall be paid to prevailing winds to reduce the drifting of abrasive blast residue, dust, and paint or coating overspray. At no time should drifting material exceed governmental agency's laws, codes, guidelines, etc. Public noise exposure shall be limited to hours of operation specified and delineated by the Owner. Contractor shall provide and maintain dust and over-spray control from the coating application and surface preparation operations to prevent damage or nuisance to property or persons with the Contractor solely responsible for all claims.

PART 2 -- PRODUCTS

2.01 GENERAL

A. Where references to proprietary products appear in the specifications or drawings, whether or not followed by the words, "or approved equal" it is for the purpose of establishing an acceptable standard of quality or design. Unless a substitute is expressly prohibited, the Contractor may request approval of a substitute for any such propriety product. The Engineer prior to award of a contract normally will not give such approval. A request for substitution must be in writing, and must include descriptive literature, specifications, test reports or samples, Material Safety Data Sheets, as appropriate, to enable the Engineer to determine the acceptability of the product proposed for substitution. If substitution is requested as part of a shop drawing submittal, the time(s) proposed for substitution shall be clearly indicated. No substitution product shall be used on the work until written approval has been received form the Engineer. The Engineer must approve any revision or any other work made necessary by such substitution and the entire cost must be borne by the Contractor.

B. **Equivalency Properties:** Paint or coating material of manufacturers other than those specified herein shall meet or exceed, but are not limited to, the following equivalency properties:

1. Quality
2. Durability
3. Resistance to abrasion and physical damage
4. Life expectancy
5. Ability to re-coat in future
6. Solids content by volume

7. Dry film thickness per coat

8. Compatibility with other coatings

9. Suitability for the intended service

10. Resistance to chemical attack

11. Temperature limitations in service and during application

12. Type and quality of recommended undercoats and topcoats

13. Ease of application

14. Ease of repairing damaged areas

15. Stability of colors

C. All materials shall be brought to job site in original sealed containers. They shall not be used until the Engineer has inspected contents and obtained data from information on containers or label. The containers shall be marked with the manufacturer's name, product name and/or number, identification of components, shipped in separate containers, date of manufacture or expiration of shelf life date, batch number, product use instructions and safety precautions. Shelf life restrictions shall be listed. Materials exceeding storage life recommended by the manufacturer shall be rejected pending manufacturer re-certification or rejection. Complete mixing instructions shall be provided, including acceptable thinning materials and acceptable tinting pigments when applicable. Maximum allowable quantity and type of thinner recommended shall be listed for each application method. Percent solids by volume for liquid materials shall be listed. In the case of two-component materials, the mixed solids by volume shall be listed. Theoretical spreading rate in square feet per gallon at 1-mil dry film thickness, untwined as packaged shall be listed. Unit weight per US gallon for component materials shall be listed. Recommended drying time between coats and cure time for immersion shall be listed with the drying time stated as the number of hours at °F and percent relative humidity and at the upper and lower limits of recommended application temperature and humidity. Pot life after mixing of the two-component or multicomponent coatings shall be listed with a description of variations caused by changes in temperature, humidity, or other ambient conditions. Safety precautions including but not limited to flammability, toxicity, allergenic properties, and any other characteristics requiring shop and field precautions shall be identified and specific safety practices shall be stipulated including ventilation requirements during application inside a closed structure or tank.

D. All coatings and paints shall be stored to protect them from weather and excessive heat or cold. Flammable coatings or paints must be stored to conform to City, County, State, and Federal safety codes for flammable and toxic coating or paint material. At all times, coatings or paints shall be protected from freezing. Contractor shall provide a secure and lockable storage unit that will contain coating products should they spill or leak.

E. Substitutions shall be for entire coating or painting systems. All primer, intermediate, and finish coats shall be of one Manufacturer. Application of varied Manufacturers' products to one another is prohibited, unless approved by the Engineer in writing.

F. Coating materials shall be suitable for the intended use. Materials shall be recommended by their Manufacturer for the intended use.

G. Only high-grade products of Manufacturer's having an established good reputation in the manufacture of quality protective coatings shall be used.

H. Where alternate products are specified, selection from among the alternates is at the Contractor's option.

1. Materials and processes for hot-dip galvanized products shall conform to ASTM A-123.

J. All paint and coatings products proposed for use by the Contractor shall qualify under all regulations in force at the project site, regarding VOC (gm/l) levels. Contractor shall submit to the Owner, the manufacturer's VOC levels on all products, prior to their approval. If Contractor applies any coatings for which he has not submitted Manufacturer's VOC levels, or if he applies coatings that 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.

2.02 DISINFECTION MATERIALS

A. Disinfection materials shall conform to all the latest requirements of applicable regulatory agencies and American Water Works Association (AWWA) Standards (ANSI/AWWA C652).

PART 3 -- EXECUTION

3.01 GENERAL

A. All surface preparation, coating and painting shall conform to applicable standards of the National Association of Corrosion Engineers, the Steel Structures Painting Council, the American Concrete Institute, the Forest Products Research Society and the Manufacturer's printed instructions. Materials applied prior to approval of surface by the Engineer shall be removed and reapplied to the satisfaction of the Engineer at the expense of the Contractor.

B. All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice. Continuity of personnel shall be maintained and transfers of key personnel shall be coordinated with the Engineer.

C. The Contractor shall designate a supervisor at the work site during cleaning and application operations. The supervisor shall have the authority to sign any change orders, coordinate work, and make decisions pertaining to the fulfillment of the contract.

D. Dust, dirt, oil grease or any foreign matter that will affect the adhesion or durability of the finish must be removed according to manufacturer's written recommendations.

E. Coating and painting systems include surface preparation, prime coating and finish coatings. Unless specified by the Contractor and approved by the Engineer, prime coatings shall be field applied. Where prime coatings are shop applied, the Contractor shall instruct suppliers to provide the prime coat compatible with the finish coat specified. Prime coatings shall be applied in strict accordance with the coating manufacturer’s recommendations. Any offsite work, which does not conform to the specification or industry standards, shall be rejected by the Engineer. Contractor shall provide accommodations and travel for Owner’s inspector associated with shop prime inspections.

Shop applied prime coatings, which are damaged during transportation, construction, or installation, shall be thoroughly cleaned and touched up in the field as directed by the

Engineer to conform to these specifications. The Contractor shall use repair procedures, which insure the complete protection of all adjacent primer. The specified repair method and equipment may include but not be limited to wire brushing, hand or power tool cleaning, or dry air blast cleaning. In order to prevent injury to surrounding painted areas, blast cleaning may require but not be limited to use of lower air pressure, smaller nozzle and abrasive sizes, adjusted blast nozzle distance from surface, shielding and masking.

The Contractor's coating and painting equipment shall be designed for application of materials specified and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Contractor's equipment shall be subject to approval of the Engineer.

3.02 SURFACE PREPARATION, STEEL

A. Safety precautions related to the safe execution of blasting operations shall be strictly adhered to.

B. The latest revision of the following surface preparation specifications of the Steel Structures Painting Council shall form a part of this specification:

1. **Solvent Cleaning (SSPC-SP1):** Removal of oil, grease, soil and other contaminants by use of solvent, emulsions, cleaning compounds, steam cleaning or similar materials and methods which involve a solvent or cleaning action.

2. **Hand Tool Cleaning (SSPC-SP2):** Removal of loose rust, loose mill scale and other detrimental foreign matter to degree specified by hand chipping, scraping, sanding and wire brushing.

3. **Power Tool Cleaning (SSPC-SP3**): Removal of loose rust, loose mill scale and other detrimental foreign matter to degree specified by power wire brushing, power impact tools or power sanders.

4. **White Metal Blast Cleaning (SSPC-SP5):** Blast cleaning to a gray-white uniform metallic color until each element of surface is free of all visible residues.

5. **Commercial Blast Cleaning (SSPC-SP6):** Blast cleaning until at least two-thirds of each element of surface area is free of all visible residues.

6. **Brush-off Blast Cleaning (SSPC-SP7):** Blast cleaning to remove loose rust, loose mil scale and other detrimental foreign matter to degree specified.

7. **Near White Blast Cleaning (SSPC-SP10):** Blast cleaning to nearly white metal cleanliness, until at least 95 percent of each element of surface area is free of all visible residues.

8. **Power Tool Cleaning to Bare Metal (SSPC-SP 11T):** Power tool cleaning until surface is free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide, corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted.

In case of question concerning the quality of blast cleaning provided, the SSPC blasting standards for visual comparison and the corresponding definitions shall be consulted. The Engineer shall be the sole judge as to whether the quality of blast cleaning conforms to the visual comparison standards, and his decision as to any allowable deviation shall be final.

C. Slag and weld accumulation and spatters not removed by the Fabricator, Erector or Installer shall be removed. All sharp edges shall be peened, ground or otherwise blunted as required by the Engineer.

D. Field blast cleaning for all surfaces shall be dry method unless otherwise approved by the Engineer.

E. Particle size of abrasive used in blast cleaning shall be that which will produce a surface profile in accordance with recommendations of the Manufacturer of the specified coating or paint system to be applied.

F. Abrasive used in blast cleaning operations shall be new, washed, graded and free of contaminants that would interfere with adhesion of coating or paint and shall not be reused unless approved by the Engineer.

G. During blast cleaning operations, caution shall be exercised to insure that existing coatings or paints are not exposed to abrasion from blast cleaning.

H. The Contractor shall keep the area of his work in a clean condition and shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to performance of work or operation of existing facilities.

I. Blast cleaned surfaces shall be cleaned prior to application of specified coatings or paints.

J. Specific Surface Preparation: Surface preparation for the specific system shall be as designated in the PAINTING AND COATING SYSTEM.

3.03 Not Used

3.04 Not Used

3.05 APPLICATION, GENERAL

A. Coating and paint application shall conform to the requirements of the Steel Structures Painting Council, Paint Application Specifications SSPC-PAI, latest revision for "Shop, Field and Maintenance Painting", and recommended practices of the National Association of Corrosion Engineers, and the American Concrete Institute, the Forest Products Research Society, and the Manufacturer of the coating and paint materials.

B. Thinning shall be permitted only as recommended by the Manufacturer and approved by the Engineer. All thinning and use of solvent shall not cause the resulting coating/thinner mixture to be in violation of prevailing governmental agency's laws, regulations, guidelines, etc. Contractor shall hold harmless the Owner and /or his representative, and the maker of this specification from all fines, levies, penalties, damages, etc. for exceeding said Volatile Organic Content levels. When thinning is necessary, only the products of the manufacture furnishing the paint or coating shall be used.

C. All coatings and paints shall be strained as recommended by the Manufacturer and approved by the Engineer.

D. Coating procedures and re-coat/topcoat cycles are critical. It is imperative that the Manufacturer's recommendations be strictly followed. The Manufacturer prior to starting alternate procedures must approve any deviation from printed literature in writing.

E. Each application of coating or paint shall be applied evenly, free of brush marks, sags, or

runs, with no evidence of poor workmanship. Care shall be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.

F. Protective coverings or drop cloths shall be used to protect floors, fixtures, and equipment. Care shall be exercised to prevent coatings or paints from being spattered onto surfaces, which are not to be coated or painted. Overspray causing property damage shall be the sole responsibility of the Contractor.

G. When two coats of paint or coating are specified, the first coat shall contain sufficient approved color additive to act, as an indicator of coverage or the two coats must be of contrasting color.

H. All material shall be applied as specified.

I. All welds and irregular surfaces shall receive a brush coat of the specified product after to application of the first complete coat.

J. Where number of coats is specified, they shall be considered a minimum. Where the dry film thickness is specified, the total system dry film thickness is considered to be a minimum. Individual coats may vary as to dry film thickness within the parameters specified by the manufacturer.

3.06 COATING SYSTEMS APPLICATION

A. After completion of surface preparation as specified for the specific system, materials shall be applied as designated in the PAINTING AND COATING SYSTEM.

3.07 SCHEME

A. The colors shall be determined by the Owner for paints and coating specified in the PAINTING AND COATING SYSTEM. Owner may select any standard color, or combination of two standard colors for the tank exterior (two tone- lower ring).

3.08 DISINFECTION

A. Disinfection of interior surfaces shall be performed by the Contractor in the presence of the Engineer in accordance with all the latest requirements of applicable regulatory agencies and the American Water Works Association (AWWA) Standard C652. Section 4.2, Chlorination Method 2.

B. Ventilation specified in 3.10 shall be completed by the Contractor prior to final disinfection.

C. Prior to disinfecting, the complete interior shall be washed down with clean water and thoroughly flushed out in accordance with AWWA C 652-92 Section 2 CLEANING.

D. Chlorine for disinfection shall be in accordance with AWWA C 652 Section 3 FORMS OF CHLORINE FOR DISINFECTION - Section 3.3 Calcium Hypochlorite.

E. Disinfection shall be in accordance with AWWA C 652 Section 4 ALTERNATE METHODS OF CHLORINATION - Section 4.2 Chlorination Method 2. The chlorinated water shall be discharged after being neutralized by chemical treatment according to AWWA C 652 APPENDIX B DISPOSAL OF HEAVILY CHLORINATED WATER. Verification of water neutrality shall be verified by appropriate chlorine content test kit and procedures.

3.09 Not Used

3.10 EXTENDED VENTILATION

A. All solvent vapors shall be completely removed by suction type explosion-proof exhaust fans and blowers. Approved exhaust fans or blowers shall be provided and installed by the Contractor. Fuel or electricity cost shall be borne by the Contractor. Roof hatches shall be closed. Manway covers not covered by a fan shall be covered with a screen to prevent unauthorized entry and screen grid shall allow adequate airflow for ventilation. The Owner shall maintain the operation oversight of the ventilation operation. Ventilation shall continue throughout the Manufacturer's recommended curing cycle of the interior coating on a 24-hour basis until cure times have been met. Interior floor cure shall be extended to 50% beyond the Manufacturer's recommended cure cycle.

3.11 SPENT ABRASIVE STORAGE AND DISPOSAL

A. **Site Storage and Handling:** The contractor shall pay strict attention to the requirements of 40 CFR 262 and 40 CFR 265 for the on-site handling of debris, with special attention given to the time of storage, amount of material stored at any one time use of proper containers, and personnel training. Spent abrasive / coating mixture shall not be placed on the unprotected ground and shall be shielded adequately to prevent dispersion of the mixture by wind or rainwater. The area around the manway and the path to the storage area shall be protected. Any evidence of improper storage shall be cause for immediate shutdown of the project until corrective action is taken.
Sampling and Testing: On the first complete day of abrasive blast cleaning operation on the interior coatings the spent abrasive/coating mixture shall be tested to determine if it is classified as hazardous in accordance with Appendix II of 40 CFR 261. Sampling shall be conducted in the presence of the inspector. Testing shall be conducted at a State approved testing laboratory with certification in writing verifying certification number as provided by the Environmental Laboratory Accreditation Program. At a minimum, the samples shall be tested for total concentrations of the 17 metals identified in Title 22, for comparison to Total Threshold Concentration (TTLC) values. The California Waste Extraction Test (WET) shall be preformed for each sample for which the total concentration exceeds 10 times the STLC value, if any, specified in Title 22. ToxiDistrct Characteristics Characteristic Leaching Procedure (TCLP) testing shall be preformed for each analyte of each sample for which the total concentration exceeds 20 times the TCLP values, if any, specified in the Federal Resource Conservation and Recovery Act. Reactivity, Corrosively and Ignitability testing shall be preformed as required by Title 22 and/or the disposal facility.
Cost of sampling and testing shall be borne by the Contractor. Three copies of the testing laboratory results shall be given to the Owner.

C. Transportation and Disposal of Debris Options:

1. No spent abrasive/coating mixture shall be removed from job site prior to receipt by Owner of laboratory results and until removal is authorized by Owner.

2. If any of the spent abrasive/coating mixture exceed the concentrations permissible the Contractor shall arrange to have the mixture transported from the site in accordance with the requirements of the Federal Resource Conservation and Recovery Act; 40 CFR 263, and disposed of properly in accordance with 40 CFR 264 and 40 CFR 268; Title 22 and Title 26 of the California Administrative Code; and

all applicable regulations of all local, state, and federal agencies having jurisdiction over the disposal of spent abrasive blast media, removed coating materials, and other waste, whether hazardous or nonhazardous. Signed manifests shall be returned to the Owner to verify that all steps of the handling and disposal process have been completed properly.

3. If none of the spent abrasive / coating exceed the concentrations permissible the contractor shall arrange to have the mixture removed completely from the project location and disposed of in a manner consistent with all governmental laws, regulations, guidelines, etc. Signed manifests shall be returned to the Owner to verify that all steps of the handling and disposal process have been completed properly. In the removal of mill scale or epoxy coatings the Owner may make exceptions to offsite disposal providing all Material Safety Data Sheets for the media are fully disclosed and submitted along with a written request for onsite disposal. Request must be made four weeks in advance of abrasive blast cleaning operations. All other type of coatings including coal tar and vinyl coatings will not be considered for onsite disposal.

D. After proper disposal of the mixture the area where the spent abrasive / coating mixture and the storage site of unused abrasive shall be cleaned and free of abrasive residue.

3.12 SITE RESTORATION

A. Upon completion of the work, all staging, scaffolding, containers, etc. shall be removed form the site in a manner approved by the Engineer. Disposal of items deemed "Hazardous" by whatever governmental agency shall be disposed of in a manner consistent with respective agencies laws, rules guidelines, etc., at no additional cost to the Owner. Coating or paint spots and oil or stains upon adjacent surfaces shall be removed and the job site cleaned. All damage to surfaces and/or landscaping, etc. resulting from the Contractor's activities shall be cleaned, repaired, refinished or replaced to the satisfaction of the owner at no cost to the Owner.

3.13 ONE (1) YEAR WARRANTY INSPECTION

A. **Warranty Inspection:** Warranty inspection shall be conducted of both the interior and exterior coatings during the eleventh month following Notice of Completion of the Project. All entities present at the pre job Conference are required to attend this inspection. The Owner will establish the date for the warranty inspection and will notify the Contractor at least 14 days in advance. The Owner shall determine one of two methods for the warranty inspection:

Option # 1 Dry Inspection

1. The Owner shall drain the tank and remove any silt covering the floor.

2. The Contractor shall provide suitable lighting to conduct inspection.

3. The interior and exterior coatings shall be visually inspected.

4. Defective areas shall be designated for remedial repair and documented.

5. An inspection report shall be prepared by the Inspector and delivered to the Owner and Contractor. The report shall set forth the number and type of failures observed, the percentage of failure on a logical area basis.

6. The Contractor shall proceed at Owners notice to accomplish remedial repairs according to Section 4.

Option # 2 Underwater inspection and repair

1. The Owner shall advise the Contractor that underwater inspection option has been elected. Contractor shall select and retain an independent inspector for said inspection, as approved by the Owner.

2. The inspection shall be conducted by a qualified inspection firm that specializes in underwater coating inspections.

3. Owner shall request an inspection report be prepared by the diver and delivered to the Owner and Contractor. The report shall set forth the number and type of failures observed, the percentage of failure on a logical area basis. The report requested by the Owner shall contain 35MM photographs and/or a comprehensive narrated video detailing problem areas. Contractor shall make arrangements with the Owner for repairs in accordance with the independent inspector's recommendations. In the event repairs are not made within 30 days, or as approved by the Owner, Owner shall arrange for repairs and said costs shall be borne by the Contractor.

4. Exterior coatings to be visually inspected.

B. **Remedial repairs:** All identified coating defects shall be remedially repaired at Contractors expense in accordance with the specifications of this document and at the Owners direction. Logical areas (e.g. a shell plate) with an excess of 25% of the coating defective shall be completely removed and re-coated. At the Owners option small site repairs may be conducted during the underwater inspection phase of the inspection by utilizing N.S.F. approved underwater curing epoxy systems. Cost of underwater repair to be borne by the Contractor. A State of California Contractors license is required to perform coating application both in a drained tank or structure or underwater.

C. **Guarantee:** The acceptance by the Owner of the completed work as herein specified is subject to the guarantee of the work completed by the Contractor against any repairs, leaks or damage caused by defective workmanship or materials furnished by the contractor for the specifications from the date of Notice of Completion of the work.

Contractor shall guarantee the coating systems for three (3) years. The reservoir interior coating shall be left without any observed flaws or defects following the 1-year inspection. The Owner will conduct a 3-year inspection at its own expense. Widespread or excessive coating system failures, shown to be due to either poor application or defective materials, shall be repaired or replaced by Contractor. Minor common or typical coating blemishes or oxidation will not be the responsibility of the Contractor.

PART 4 -- SYSTEMS

4.01 INTERIOR

COATING SYSTEMS FOR INTERIOR STEEL
Roof / Knuckle/Above Overflow - AWWA D102-11 (ICS-5) Inside Coating System No. 5
System Type: Zinc / Epoxy

Surface Preparation: All surfaces shall be prepared in accordance with SSPC-SP10/NACE No. 2 Near-White Blast Cleaning to exhibit a dense, angular and uniform surface profile of 1.5 mils minimum, 3.0 mils maximum.

Prime Coat: Series 94-H20 | Hydro-Zinc at 2.5 to 3.5 mils DFT

Stripe-Coat Procedure to Prevent Edge Rusting: Series L40F | Pota-Pox Plus or Series V140F | Pota-Pox Plus (Color 1255 Beige); brush-applied to all welds, voids, nuts, bolts and sharp edges referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating

Intermediate Coat: Series L140F | Pota-Pox Plus or Series V140F | Pota-Pox Plus (Color 1255 Beige) at 4.0 to 6.0 mils DFT

Finish Coat: Series L140F | Pota-Pox Plus or Series V140F | Pota-Pox Plus (Color 15BL Tank White) at 4.0 to 6.0 mils DFT

Total System DFT: 10.5 mils minimum

Floor / Walls (To Overflow) - AWWA D102-11 (ICS-3) Inside Coating System No. 3
System Type: Zinc / Epoxy

Surface Preparation: All surfaces shall be prepared in accordance with SSPC-SP10/NACE No. 2 Near-White Blast Cleaning to exhibit a dense, angular and uniform surface profile of 1.5 mils minimum, 3.0 mils maximum.

Prime Coat: Series 94-H20 | Hydro-Zinc at 2.5 to 3.5 mils DFT

Stripe-Coat Procedure to Prevent Edge Rusting: Series L40F | Pota-Pox Plus or Series V140F | Pota-Pox Plus (Color 1255 Beige); brush-applied to all welds, voids, nuts, bolts and sharp edges referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating

Finish Coat: Series 22 | Epoxoline (Color WH08 White) at 20.0 to 25.0 mils DFT

Total System DFT: 22.5 to 28.5 mils

4.02 EXTERIOR PAINT

COATING SYSTEM FOR EXTEIROR STEEL
System Type: Zinc / Epoxy / Polyurethane / Fluoropolymer
AWWA D102-11 (OCS-4) Outside Coating System No. 4

Surface Preparation: SSPC-SP6/NACE No. 3 Commercial Blast Clean all surfaces to create a dense, angular and uniform surface profile of 1.5 mils minimum, 3.0 mils maximum.

Prime Coat: Series 94-H2O | Hydro-Zinc; 2.5 to 3.5 mils DFT

Stripe-Coat Procedure to Prevent Edge Rusting: Series L140F | Pota-Pox Plus or Series V140F | Pota-Pox Plus (Color 1255 Beige); brush-applied to all welds, voids, nuts, bolts and sharp edges referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating

Intermediate Coat: Series 1095 | Endura-Shield (Color TBD by Manufacturer); 4.0 to 5.0 mils DFT

Finish Coat: Series V700 | Low VOC HydroFlon gloss or Series V701 | Low VOC HydroFlon semi-gloss (Color TBD by Owner); 2.5 to 3.5 mils DFT

Total System DFT: 9.0 to 12.0 mils

- END OF SECTION -

SECTION 13656 – WELDED STEEL WATER RESERVOIRS AND TANKS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall design, fabricate, and erect a welded steel water reservoir, foundation, connections, and appurtenances, complete and operable, including all labor, materials, and equipment, in accordance with AWWA D100-21, Article 6 of the State of California Waterworks Standards, and the Contract Documents, for use as a potable water reservoir in a public drinking water system.

B. The tank shall have a *usable* capacity of no less than 285,000 gallons, accounting for dead-space below the tank outlet pipe and above the maximum operating level (MOL).

C. Tank shall be self-supported on a concrete ringwall foundation.

D. The tank shall be coated and lined as specified herein, in the contract documents (Section 9810), AWWA D100-2, and NSF 61 certified materials (interior).

E. Provide appurtenances, including but not limited to, roof access, manways, inlet and outlet pipes, drainage inlet, overflow, vents, sampling ports, etc. Provide supports, openings, conduit supports, and other incidentals. Design and install inlet and outlet piping as required for seismic loads, tank movement, and settlement.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Reference herein to "AWWA Standards" shall mean the most recently published standards of the American Water Works Association, 6666 West Quincy Avenue, Denver, CO 80235.

B. References herein to "API Standards" shall mean the most recently published standards of the American Petroleum Institute, 1220 L Street, Northwest, Washington, D.C. 20005.

C. Commercial Standards:

AWWA D100-21 - Standard for Welded Carbon Steel Tanks for Water Storage

AWWA D102-21 – Standard for Coating Steel Water-Storage Tanks

National Sanitation Foundation (NSF) International 61 Certification

D. State of California Waterworks Standards, Article 6, Distribution Reservoirs.

E. Minimum requirements of listed reference specifications, codes, and standards shall supersede contract specifications, should conflicts arise.

1.3 QUALIFICATIONS OF TANK SUPPLIER

A. The Contractor and subcontractors shall have at least 10 years of experience in the design, fabrication, erection, and coating of welded steel water storage tanks.

B. Construction of the tank is to be by qualified personnel skilled in the fabrication and erection of welded steel potable water tanks. The Contractor shall be fully responsible for the completed installation including purchase of materials, steel fabrication, grading, foundation, piping, welding and erection, coatings, appurtenances, and quality of the Work.

C. Strict adherence to the standards of design, fabrication, erection, product, quality, and long-term performance, established in this Specification is required.

1.3 CONTRACTOR SUBMITTALS

A. Complete and detailed design calculations for the tank, inclusive of tank foundation, walls, floor, roof, columns, ladders, inlet/outlet piping, together with shop drawings and appurtenance data, shall be furnished in accordance with Section 01300 - Contractor Submittals. All design calculations shall be stamped and signed by a Registered Structural Engineer licensed in California.

B. Submittals shall be approved by the ENGINEER, however, said approval does not relieve the CONTRACTOR of responsibility for deviations from the Contract Drawings or Specifications.

C. Details of welded joints shall be submitted including sequences and methods for welding three plate intersections for floors and roofs. Mill test reports shall be submitted for all steel materials.

C. Provide submittals for miscellaneous tank appurtenances and materials, including but not limited to, drainage and supply pipe, valves, concrete D.I.'s, sand backfill, concrete mix, etc.

D. Provide California Air Board permit for application of architectural coatings.

1.4 QUALITY ASSURANCE

A. **General:** The CONTRACTOR shall provide quality assurance services as required by ANSI/AWWA D100-21 and as required by this Section. Should the requirements differ, the Contractor shall present the discrepancy to the Engineer prior to bid. Decisions regarding discrepancies found or presented after the bid shall be per sole discretion of Engineer. The CONTRACTOR shall prepare a written report for inspection and testing as specified in ANSI/AWWA D100, Section 11.

B. **Automatic Welding:** If the CONTRACTOR uses an automatic welding machine for the horizontal welds in the tank shell, the following startup procedure shall be used. After the first 10 feet of the first pass is welded, the CONTRACTOR shall air carbon arc gouge into the root of the weld to allow the ENGINEER to visually confirm that full penetration and fusion is attained. If full penetration and fusion have not been attained, the machine shall be immediately corrected. The procedure shall be repeated until satisfactory welding is achieved. Defective welding in the startup area shall be repaired.

C. **Inspection and Testing of Welds:** Performing and paying for inspection and testing of welds shall be CONTRACTOR'S responsibility and shall be completed before application of protective coatings. Welding of each successive shell course shall not begin until the previous shell course welds have been completely welded, inspected, and repaired. On

joints where radiography is required, the welding of each worker shall be radiographed on the worker's first joint, before work begins on subsequent joints. The ENGINEER shall be furnished certified copies of all radiography reports.

1. Shell Welds: All vertical welds shall be radiographed for 100 percent of their length. Welds not meeting the acceptance criteria in ANSI/AWWA D100 shall be repaired and radiographed until the requirements are met. Horizontal welds shall be radiographed in accordance with ANSI/AWWA D100.

2. Roof Welds: Welds in contact with the reservoir contents shall be spot radiographed per ANSI/AWWA D100.

3. Bottom Welds: Welds joining the bottom plates shall be vacuum tested using solution film. Any detectable leaks shall be marked and repaired by welding. Sealing shall not be accomplished by peening. One spot radiograph shall be taken on 10 percent of the butt-welded annular plates. The inside shell-to-bottom fillet weld shall be vacuum tested using solution film before the outside weld is made.

4. Shell Reinforcing Plates: After the reinforcing plate is fitted to the shell, but before the pipe or neck fitting is inserted, the reinforcing plate shall be seal welded to the shell at the inner and outer edges. Air pressure shall then be applied to the space between the reinforcing plate and the shell, and the seal welds tested with solution film.

D. **Bottom Distortion:** The CONTRACTOR shall use a written procedure for fitting and welding the bottom plates. Out-of-plane distortion shall not exceed 0.75 percent of the tank radius.

E. **Shell Distortion:** Local deviations, such as flat spots, peaked joints, and welding distortion shall be limited as follows:

1. Using a horizontal sweep board 36 inches long, the distance from the sweep board to the shell shall not be greater than 2-inch. Flat spots shall be measured with an external sweep board. Peaked spots shall be measured with an internal sweep board.

2. Using a vertical sweep board 36 inches long, banding of horizontal joints shall not exceed 2-inch.

Measurements shall be taken beginning with the first joints that are welded. Corrections to the fitting and welding procedure shall immediately be made if the joints are not within the above criteria for distortion. The CONTRACTOR shall submit corrective procedures for joints that have been welded but are not within the criteria for distortion.

PART 2 -- PRODUCTS

2.1 GENERAL

A. The WORK of this Section shall be furnished by a firm having experience and regular practice in the design, fabrication, and construction of welded steel water reservoirs or tanks with a record of at least five successful installations of similar size within the past three years. The firm shall provide at least five separate project references which

demonstrate the successful experience, including the name, address, and telephone number of the owner of each project.

2.2 DESIGN

A. Design shall be in accordance with the requirements of ANSI/AWWA D100-21, subject to the following modifications and additions:

3. Option to use the design, fabrication, and inspection procedures specified in Chapter 14 will NOT be permitted.

2. All shell and bottom fittings shall be flanged, unless otherwise stated.

3. The tank details shall be designed to eliminate unwelded joints that will promote corrosion, pockets that will accumulate rain water, and attachments to the shell which result in excessive localized stresses due to welding or imposed loads. The exceptions to this requirement are the roof rafters and internal roof plate lap joints.

4. Seismic design shall be in accordance with Section 13 of ANSI/AWWA D100-21, site-specific procedure (13.2.7).

5. Design Loads per AWWA D100-21 and ASCE 7. Wind load calculations shall use exposure D. Snow load shall be 80 psf minimum.

6. Tank volume shall be 285,000 gallons (minimum) between floor and MOL.

7. The lowest one day ambient mean temperature for design shall be 10 degrees F.

8. Roof transition shall be a rolled knuckled.

9. Maximum Fill and Drain Rate: 1,500 gpm

10. Top of Ringwall: 4068.85’ (msl)

11. Maximum Operating Level Elevation: 4086.85’ (msl)

12. Foundation: Type 1 (Ringwall)

2.3 TANK SHELL WELDING

A. All welds joining shell plates and wetted roof plates shall have complete joint penetration and fusion and shall be double-welded from both sides. The use of low-hydrogen electrodes is mandatory for manual welding of shell plates, for permanent attachments to the shell plates, for fittings, and for welds joining the shell plates to the bottom plates. All shell plates shall be rolled, regardless of material thickness.

2.4 ROOF AND COLUMNS

A. The roof shall be designed for the minimum specified live load and shall have a pitch as shown. Lateral bracing of rafter compression flanges shall not be assumed to be provided by friction between roof sheets and rafters. Rafters and bridging between rafters shall be designed of standard structural steel shapes. The minimum roof plate thickness shall be

1/4-inch.

B. Columns shall be fabricated from square or rectangular steel sealed at both ends and continuously welded to interior tank walls. Column bases shall be fabricated from steel plate and provided with the necessary gusset plates to distribute the load uniformly. The base plates shall be designed for a maximum foundation loading of 2,000 pounds per square foot, exclusive of the weight of water. The column bases shall not be welded to the bottom plates but shall be prevented from lateral movement by angle clips welded to the bottom plates. Where column base plates are placed over lap joints, filler plates shall be used to provide full bearing under the base. Structural steel shapes shall not be used for column bases.

C. All nuts and bolts used for erection purposes shall be hot-dip galvanized after fabrication.

2.5 TANK BOTTOM

A. The tank bottom, including sketch and annular plates, shall be fabricated from steel plate not less than 5/16-inch in thickness. The minimum annular plate width shall be determined by ANSI/AWWA D100, Section 13. Tank bottom shall be tested as specified in Section 11.11 Testing AWWA D100.

2.6 ACCESSORIES

A. Accessories such as roof access, inlet-outlet pipes, drain pipe, manholes through the shells, vent, clean-out/manways, overflow, sonic level transducer port, conduit supports, altitude sensing line port, and internal piping, shall be provided, located and sized as indicated.

B. Piping fittings, flanges, couplings, and appurtenances shall conform to Sections 15000 - Piping, General, and 02572 - Steel Pipe-Fabricated Specials. Interior nuts and bolts, clips, and support angles shall be of Type 316 stainless steel.

C. The design of the access manholes in the lowest ring of the interior and exterior shells shall conform to the requirements of ANSI/API 650 and shall be hinged as indicated.

D. Submerged bolts inside the tank shall be of Type 316 stainless steel. Other miscellaneous metal used inside the reservoir and regularly submerged that support permanent loads, ladders, or appurtenances shall be of Type 316 stainless steel. All buried hardware for valves, fittings, etc. shall be Type 316 stainless steel and wrapped in 10 mil plastic.

D. All railings and grate walkways shall be aluminum.

E. Roof access ladder shall be provided. Ladder shall include a cage starting 7’ from ground and extending 42” above top platform. Ladder shall be equipped with security devices including, but not limited to, bottom 8’ expanded metal on cage exterior, and hinged security door or hatch at cage entry with locking mechanism for both open and closed positions. The ladder access shall include a fall prevention system with rail, harness, and sliding clip. Fall prevention shall be Miller Saf-T-Climb system, or approved equal. Provide two (2) harnesses with the project. All fall prevention systems shall meet current OSHA requirements. Provide safety railing within 20’ of access hatch. Provide UV rated coated stainless steel cable with 7,500 lbs breaking strength (min.) on top of the tank though D hooks with four stainless steel mechanical connectors for fall prevention.

F. Venting screens shall be made of stainless steel with a mesh capable of restricting flying insects.

G. All inlet/outlet piping shall be welded steel with fusion bonded epoxy coating and lining. Epoxy linings shall be compatible with potable water and meet the requirements of NSF 61. Piping shall have flanged ends. Buried pipe shall have sand backfill to at least 12" above/around the pipe. Provide 10 mil pipe tape on all buried steel pipe to 6" above grade. Exposed pipe shall have a finish coat per the tank interior or exterior. All pipe shall be restrained, and include seismic/settlement devices to mitigate any stress on the tank or piping due to movement.

H. Drainage pipe shall be 14 gauge galvanized CMP.

I. Small diameter buried water supply pipe (6" or less) shall be C900 PVC, class 150.

J. Provide a 1" sample port at 3' from floor with welded half-coupling and ¾" brass corporation stop. Provide 24" x 24" x 8" SS hinged/locking housing with welded angle for mounting. Housing to be Hoffman A242408LPEMCSS or equal.

K. Provide and install roof equipment hatch for tank mixer, and access hatch.

L. Tank Access shall include two (two) side shell manways, including one (1) hinged manway no less than 36" in diameter.

M. Provide welded studs for UniStrut conduit support on side of tank for eight (8) 2" conduit at at 6' o.c.

N. Provide a 1" welded half coupling for altitude sensing line at 6" above floor. Provide ¾" FIPT brass angle shut off with schedule 40 threaded brass pipe from tank connection to 12" below the ground (transition to plastic coated copper tubing). Secure pipe to tank foundation with copper or brass pipe strap. Wrap all buried metallic pipe with 10 mil pipe. Maintain positive slope of sensing line from valve to tank.

PART 3 -- EXECUTION

3.1 GENERAL

A. Tank construction shall be in accordance with the requirements of ANSI/AWWA D100-21.

3.2 FABRICATION AND WELDING

A. In assembly and during welding, the component parts shall be adequately clamped, supported and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be as specified in ANSI/AWWA D100.

B. Upon completion of welding, all weld spatter, flux, slag, burrs left by attachments, and excessive weld reinforcement shall be removed. Welds shall be repaired to produce a workmanlike appearance with uniform weld contours and dimensions. External corners and edges shall be ground to a minimum 1/16-inch radius. Internal corners and edges shall be ground to a minimum 1/8-inch radius, except that the internal roof plate edges shall be ground to a minimum 1/16-inch radius before application of prime coatings. Grind

access door and frame to a minimum 1/4-inch radius, and provide a second pass with a finer grit disc to ensure no burrs remain.

3.3. OTHER WORK ITEMS

A. CONTRACTOR shall connect all external piping for drainage, inlet, outlet, and overflow to existing works as shown on the drawings. Install all underground per Owner's Standard Construction Specifications, or as indicated in the project documents. Identify and verify existing invert and control elevations and locations prior to ordering materials.

B. Design and construct ringwall foundation in accordance with the geotechnical report recommendations prepared for the site by the Owner.

C. Provide and install flexible ground sealer around base of tank at foundation. Seal exposed concrete and grout with W.R. Meadows 244-20 masonry sealer, applied using a brush and roller. Apply to vertical edge of concrete to 6" below finish grade.

- END OF SECTION -

SECTION 15000 - PIPING, GENERAL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide all piping systems indicated, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section shall apply to all piping sections in Divisions 2 and 15 of the contract specifications.

C. The mechanical drawings define the general layout, configuration, routing, method of support, pipe size, and pipe type. The mechanical drawings are **not** pipe construction or fabrication drawings. It is the CONTRACTOR's responsibility to develop the details necessary to construct all mechanical piping systems, to accommodate the specific equipment provided, and to provide all spools, spacers, adapters, and connectors for a complete and functional system.

1.2 CONTRACTOR SUBMITTAL

A. **General:** Submittals shall be furnished in accordance with Section 01300 - Contractor Submittals.

B. **Shop Drawings:** Shop Drawings shall contain the following information:

1. Drawings: Layout drawings including all necessary dimensions, details, pipe joints, fittings, specials, bolts and nuts, gaskets, valves, appurtenances, anchors, guides, and material lists. Fabrication drawings shall indicate all spool pieces, spacers, adapters, connectors, fittings, and supports to accommodate the equipment and valves in a complete and functional system.

C. **Samples:** Performing and paying for sampling and testing as necessary for certifications are the CONTRACTOR'S responsibility.

D. Certifications

1. All necessary certificates, test reports, and affidavits of compliance shall be obtained by the CONTRACTOR.

2. A certification from the pipe fabricator that all pipes will be manufactured subject to the fabricator's or a recognized Quality Control Program. An outline of the program shall be submitted to the ENGINEER for review prior to the manufacture of any pipe.

PART 2 -- PRODUCTS

2.1 GENERAL

A. **Extent of Work:** Pipes, fittings, and appurtenances shall be provided in accordance with the requirements of the applicable Sections of Divisions 2 and 15 and as indicated.

B. **Pipe Supports:** Pipes shall be adequately supported, restrained, and anchored in

accordance with building codes, pipe manufacturer recommendations, and as indicated on the plans. Supports shall resist stresses created by a seismic load per IBC.

C. **Lining:** Application, thickness, and curing of pipe lining shall be in accordance with the applicable Sections of Division 2 and Division 9, unless otherwise indicated.

D. **Coating:** Application, thickness, and curing of pipe coating shall be in accordance with the applicable Sections of Division 2 and Division 9, unless otherwise indicated. Pipes above ground or in structures shall be field-coated in accordance with Section 09800 - Protective Coating.

E. **Pressure Rating:** Piping systems shall be designed for the maximum expected pressure. All piping shall be designed and tested for a minimum working pressure of 150 psi minimum.

F. **Inspection:** Pipe shall be subject to inspection at the place of manufacture. During the manufacture of the pipe, the ENGINEER shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with requirements.

G. **Tests:** Except where otherwise indicated, materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards. Welds shall be tested as indicated. The CONTRACTOR shall be responsible for performing material tests.

H. **Welding Requirements:** Welding procedures used to fabricate pipe shall be prequalified under the provisions of ANSI/AWS D1.1 - Structural Welding Code. Welding procedures shall be submitted for the ENGINEER'S review for longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.

I. **Welder Qualifications:** Welding shall be done by skilled welders and welding operators 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 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests. Qualification testing of welders and materials used during testing are part of the WORK.

2.2 PIPE FLANGES

A. **General:** Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise indicated. Attachment of the flanges to the pipe shall conform to the applicable requirements of ANSI/AWWA C207. Flange faces shall be perpendicular to the axis of the adjoining pipe. Flanges for miscellaneous small pipes shall be in accordance with the standards indicated for these pipes.

B. Pressure Ratings

1. 150 psi or less: Flanges shall conform to either ANSI/AWWA C207 - Steel Pipe Flanges for Waterworks Service--Sizes 4 In. Through 144 In., Class D, or ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings, 150-lb class.

2. 150 psi to 275 psi: Flanges shall conform to either ANSI/AWWA C207 Class E or Class F, or ANSI/ASME B16.5 150-lb class.

3. 275 psi to 700 psi: Flanges shall conform to ANSI/ASME B16.5, 300-lb class.

4. Selection based on test pressure: AWWA flanges shall not be exposed to test pressures grater than 125 percent of rated capacity. For higher test pressures, the next higher rated AWWA flange or an ANSI-rated flange shall be selected.

C. **Blind Flanges:** Blind flanges shall be in accordance with ANSI/AWWA C207, or as indicated for miscellaneous small pipes. Blind flanges for pipe sizes 12 inches and greater shall be provided with lifting eyes in form of welded or screwed eye bolts.

D. **Flange Coating:** Machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.

E. **Flange Bolts:** All hardware (bolts, nuts, washers, rods, etc.) shall be 300 or 400 series stainless steel. All washers shall have plastic or Teflon separators where they may make contact with fusion bonded coatings. Buried hardware shall be wrapped in plastic. Studs and bolts shall extend through the nuts a minimum of 1/4-inch. All-thread studs shall be used on all valve flange connections, where space restrictions preclude the use of regular bolts.

F. **Insulating Flanges:** Insulated flanges shall have bolt holes 1/4-inch diameter greater than the bolt diameter.

G. **Insulating Flange Sets:** Insulating flange sets shall be provided where indicated. Each insulating flange set shall consist of an insulating gasket, insulating sleeves and washers and a steel washer. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1-1/2-inch or smaller and shall be made of acetal resin. For bolt diameters larger than 1-1/2-inch, insulating sleeves and washers shall be 2-piece and shall be made of polyethylene or phenolic material. Steel washers shall be in accordance with ASTM A 325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength. Insulating gaskets shall be full-face.

H. **Flange Gaskets:** Gaskets for flanged joints shall be full-faced type, with material and thickness in accordance with ANSI/AWWA C207, suitable for temperatures to 700 degrees F, a pH of one to eleven, and pressures to 1000 psig. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange. Ring gaskets shall not be permitted, unless otherwise indicated.

I. Type of Pipe: Unless otherwise specified, site pipe materials shall conform to the schedule below:

Service	Size Range	Material
Sewer	4" to 10"	Per Owner Standards
Drainage	4" to 24"	Per Owner Standards
Water	3/4" to 2"	Copper/SS
Water	6" to 16""	WSP

All pipe shall be rated at no less than 150 psi working pressure.

Welded steel pipe minimum thickness shall be as follows:

8" to 14"	8 gauge
16"	3/16"

2.3 THREADED INSULATING CONNECTIONS

A. **General:** Threaded insulating bushings, unions, or couplings, as appropriate, shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are involved.

B. **Materials:** Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other non-conductive materials, and shall have ratings and properties to suit the service and loading conditions.

2.4 MECHANICAL-TYPE COUPLINGS (GROOVED OR BANDED PIPE)

A. **General:** Cast mechanical-type couplings shall be provided where indicated. The couplings shall conform to the requirements of ANSI/AWWA C606 - Grooved and Shouldered Joints. Bolts and nuts shall conform to Item 2.2E. Gaskets for mechanical-type couplings shall be compatible with the piping service and fluid utilized, in accordance with the coupling manufacturer's recommendations. The wall thickness of grooved piping shall conform with the coupling manufacturer's recommendations to suit the highest expected pressure. To avoid stress on equipment, equipment connections with mechanical-type couplings shall have rigid-grooved couplings or flexible type coupling with harness in sizes where rigid couplings are not available, unless thrust restraint is provided by other means. Mechanical-type couplings shall be bonded. The CONTRACTOR shall have the coupling manufacturer's service representative verify the correct choice and application of couplings and gaskets, and the workmanship, to assure a correct installation. To assure uniform and compatible piping components, all grooved fittings, couplings, and valves shall be from the same manufacturer.

2.5 SLEEVE-TYPE COUPLINGS

A. **Construction:** Sleeve-type couplings shall be provided where indicated, in accordance with ANSI/AWWA C219 - Standard for Bolted Sleeve-Type Couplings for Plain-End Pipe. Couplings shall be steel with steel bolts, without pipe stop. Couplings shall be of sizes to fit the pipe and fittings indicated. The middle ring shall be not less than 1/4-inch in thickness and shall be either 5 or 7 inches long for sizes up to and including 30 inches and 10 inches long for sizes greater than 30 inches, for standard steel couplings, and 16 inches long for long-sleeve couplings. The followers shall be single-piece contoured mill sections welded and cold-expanded as required for the middle rings, and of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Bolts and nuts shall conform to Item 2.2E. Buried sleeve-type couplings shall be epoxy-coated at the factory as indicated.

B. **Pipe Preparation:** Where indicated, the ends of the pipe shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.

C. Gaskets

1. Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," Grade 60, or equivalent suitable elastomer. The rubber in the gasket shall meet the following specifications:

    a. Color - Jet Black

    b. Surface - Non-blooming

    c. Durometer Hardness - 74 ? 5

    d. Tensile Strength - 1000 psi Minimum

    e. Elongation - 175 percent Minimum

2. The gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet the requirements of ASTM D 2000 - Classification System for Rubber Products in Automotive Applications, AA709Z, meeting Suffix B13 Grade 3, except as noted above. Gaskets shall be compatible with the piping service and fluid utilized.

D. **Insulating Couplings:** Where insulating couplings are required, both ends of the coupling shall have a wedge-shaped gasket which assembles over a rubber sleeve of an insulating compound in order to obtain insulation of all coupling metal parts from the pipe.

E. **Restrained Joints:** Sleeve-type couplings on pressure lines shall be harnessed unless thrust restraint is provided by other means. Harnesses shall be designed by the pipe manufacturer in accordance with Manual M11, or as indicated. Harness sets shall be designed for the maximum test pressure of the pipe in which they are installed.

2.6 FLEXIBLE CONNECTORS

A. **Low Temperatures:** Flexible connectors shall be installed in all piping connections to engines, blowers, compressors, and other vibrating equipment, and where indicated. Flexible connectors for service temperatures up to 180 degrees F shall be flanged, reinforced Neoprene or Butyl spools, rated for a working pressure of 40 to 150 psi, or reinforced, flanged duck and rubber, as best suited for the application. Flexible connectors for service temperatures above 180 degrees F shall be flanged, braided stainless steel spools with inner, annular, corrugated stainless steel hose, rated for minimum 150 psi working pressure, unless otherwise indicated. The connectors shall be a

minimum of 9 inches long, face-to-face flanges, unless otherwise indicated. The final material selection shall be approved by the manufacturer. The CONTRACTOR shall submit manufacturer's shop drawings and calculations.

B. **High Temperature:** Flexible connectors shall be installed in engine exhaust piping and where indicated. Connectors shall be sufficient to compensate for thermal expansion and contraction and also to isolate vibration between the engine and the exhaust piping system. Connectors shall be stainless steel bellows type, flanged, and rated for minimum 150 psi, 2000 degrees F.

2.7 EXPANSION JOINTS

A. Piping subject to expansion and contraction shall be provided with sufficient means to compensate for such movement without exertion of undue forces to equipment or structures. This may be accomplished with expansion loops, bellow-type expansion joints, or sliding-type expansion joints. Expansion joints shall be of stainless steel, monel, rubber, or other materials best suited for each individual service. The CONTRACTOR shall submit detailed calculations and manufacturer's Shop Drawings of all proposed expansion joints, piping layouts, and anchors and guides, including information on materials, temperature and pressure ratings.

2.8 PIPE THREADS

A. Pipe threads shall be in accordance with ANSI/ASME B1.20.1 - Pipe Threads, General Purpose (inch), and be made up with Teflon tape unless otherwise indicated.

2.9 PIPE INSULATION

A. Hot and cold liquid piping, flues, and engine exhaust piping shall be insulated as indicated, in accordance with the manufacturer's recommendations, contract documents, and local building codes and standards. No unprotected hot piping shall be within reach of operating personnel or other persons.

PART 3 -- EXECUTION

3.1 MATERIAL DELIVERY, STORAGE, AND PROTECTION

A. Piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground for protection against oxidation caused by ground contact. Defective or damaged materials shall be replaced with new materials.

3.2 GENERAL

A. Pipes, fittings, and appurtenances shall be installed in accordance with the requirements of the applicable Sections of Divisions 2 and 15.

B. **Lined Piping Systems:** The lining manufacturer shall take full responsibility for the complete, final product and its application. Pipe ends and joints of lined pipes at screwed flanges shall be epoxy-coated to assure continuous protection.

C. **Cleanup:** After completion of the WORK, cuttings, joining and wrapping materials, and

other scattered debris shall be removed from the Site. The entire piping system shall be handed over in a clean and functional condition.

- END OF SECTION -

SECTION 15025 - STEEL PIPE (TANK)
(ASTM A 53 / A 106, MODIFIED)

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide steel pipe and appurtenances, complete and in place, in accordance with the Contract Documents.

B. The plans define the general layout, configuration, routing, method of support, pipe size, and pipe type. The mechanical drawings are **not** pipe construction or fabrication drawings. It is the CONTRACTOR's responsibility to develop the details necessary to construct all mechanical piping systems, to accommodate the specific equipment provided, and to provide all spools, spacers, adapters, and connectors for a complete and functional system.

C. Shop Drawings for fabricated steel pipe submitted to the Engineer shall contain the following information:

Drawings: Layout drawings including all necessary dimensions, details, pipe joints, fittings, specials, bolts and nuts, gaskets, valves, appurtenances, anchors, guides, and material lists. Fabrication drawings shall indicate all spool pieces, spacers, adapters, connectors, fittings, and supports to accommodate the equipment and valves in a complete and functional system

D. All fabricated steel fittings and joints shall be factory tested for integrity in accordance with ASTM Non Destructive Testing Methods and Standards prior to application of coatings and linings. Testing methods shall be approved by Engineer. Testing shall be performed by an independent testing service, and results forwarded to the Owner.

PART 2 -- PRODUCTS

2.1 PIPE MATERIAL AND FABRICATION

A. **Water, Air, Fuel Gas, Oil, Steam, and Waste Service:** Unless otherwise indicated, galvanized and black steel pipe shall conform to ASTM A 53 - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless or ASTM A 106 - Specification for Seamless Carbon Steel Pipe for High Temperature Service, Grade B, and shall be Schedule 40 or 80, as indicated in the Piping Schedule. Galvanized steel pipe shall not be cement mortar lined unless so indicated.

Welding Requirements: Welding procedures used to fabricate pipe shall be prequalified under the provisions of ANSI/AWS D1.1 - Structural Welding Code.

Welder Qualifications: Welding shall be done by skilled welders and welding operators 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 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests. Qualification testing of welders and materials used during testing are

part of the WORK.

2.2 PIPE JOINTS

A. Small diameter black steel pipe (3" or smaller) for general service shall have screwed ends with NPT threads, welded joints, or flanged joints. Screwed joints shall be made up with Teflon tape and welded joints may have butt-weld fittings, socket-weld fittings, or flanges. Where indicated, black steel pipe shall have grooved ends for shouldered couplings or plain ends for sleeve-type couplings.

B. Large diameter steel pipe (4" and larger) shall be have fabricated welded steel flanged joints. No mechanical joints shall be allowed within 15' of tank. All joints within 15' of tank perimeter shall be fully restrained.

C. Galvanized steel pipe shall have screwed ends with NPT threads made up with Teflon tape. Where indicated, galvanized steel pipe shall have grooved ends for shouldered couplings or plain ends for sleeve-type couplings. Connect galvanized pipe without "wrench bites". Galvanized coatings damaged during installation shall be replaced. Do not coat galvanized pipe unless shown on plans.

D. Mechanical joints shall use 316 SS bolts and hardware. All buried joints shall be protected with PE encasement (plastic wrap) in accordance with AWWA C105.

2.3 FITTINGS

A. **Common Use:** The following fittings shall be provided for galvanized or black steel pipe, as indicated in the Piping Schedule:

1. Threaded malleable iron fittings conforming to ANSI/ASME B 16.3 - Malleable-Iron Threaded Fittings, Classes 150 and 300.

2. Threaded cast iron fittings conforming to ANSI/ASME B 16.4 - Cast Iron Threaded Fittings, Class 125 and 250.

3. Forged steel socket welded fittings conforming to ANSI/ASME B 16.11 - Forged Fittings, Socket - Welding and Threaded.

4. Butt welding fittings conforming to ANSI/ASME B 16.9 - Factory-Made Wrought Steel Butt Welding Fittings, Schedule 40 or 80, as indicated.

B. SLEEVE-TYPE COUPLINGS

1. **Construction:** Sleeve-type couplings shall be provided where indicated, in accordance with ANSI/AWWA C219 - Standard for Bolted Sleeve-Type Couplings for Plain-End Pipe. Couplings shall be steel with stainless steel bolts and nuts, without pipe stop. Couplings shall be of sizes to fit the pipe and fittings indicated. The middle ring shall be not less than 1/4-inch in thickness and shall be either 5 or 7 inches long. The followers shall be single-piece contoured mill sections welded and cold-expanded as required for the middle rings, and of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to

provide positive confinement of the gasket. Buried sleeve-type couplings shall be epoxy-coated at the factory as indicated.

2. **Pipe Preparation:** Where indicated, the ends of the pipe shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.

C. PIPE FLANGES

Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise indicated. Attachment of the flanges to the pipe shall conform to the applicable requirements of ANSI/AWWA C207. Flange faces shall be perpendicular to the axis of the adjoining pipe. Flanges for miscellaneous small pipes shall be in accordance with the standards indicated for these pipes.

D. GASKETS

1. Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," Grade 60, or equivalent suitable elastomer. The rubber in the gasket shall meet the following specifications:

   a. Color - Jet Black

   b. Surface - Non-blooming

   c. Durometer Hardness - 74 5

   d. Tensile Strength - 1000 psi Minimum

   e. Elongation - 175 percent Minimum

2. The gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet the requirements of ASTM D 2000 - Classification System for Rubber Products in Automotive Applications, AA709Z, meeting Suffix B13 Grade 3, except as noted above. Gaskets shall be compatible with the piping service and fluid utilized.

E. COATINGS AND LININGS

Steel pipe coating/lining material shall be a 100 percent powder epoxy, certified as compliant with NSF Standard 61, applied in accordance with the ANSI/AWWA C213 - Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines, except that the surface preparation shall be as specified in the coating system schedule of this Section. The coating shall be applied using the fluidized bed or electrostatic spray process.

3. Coating DFT = 16 mils, **Scotchkote 134 or 206N, or equal.**

4. For coating of valves, DFT - 12 mils.

5. Liquid Epoxy: For field repairs, the use of a liquid epoxy will be permitted, applied in not less than 3 coats to provide a DFT of 15 mils. The liquid epoxy shall be a 100 percent solids epoxy recommended by the powder epoxy manufacturer.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. **General:** All steel pipes shall be installed in a neat and workmanlike manner, properly aligned, and cut from measurements taken at the site, to avoid interferences with structural members, architectural features, openings, and equipment. Exposed pipes shall afford maximum headroom and access to equipment, and where necessary, all piping shall be installed with sufficient slopes for venting or drainage of liquids and condensate to low points. All installations shall be acceptable to the ENGINEER.

B. **Supports and Anchors:** All piping shall be firmly supported with fabricated or commercial hangers or supports in accordance with Section 15006 - Pipe Supports. Where necessary to avoid stress on equipment or structural members, the pipes shall be anchored or harnessed. Expansion joints and guides shall compensate for pipe expansion due to temperature differences.

C. **Valves and Unions:** Water, steam, condensate, gas, vacuum, and air supply piping to fixtures, groups of fixtures, and equipment shall be provided with a shutoff valve and union, unless the valve has flanged ends. Low points in water systems and driplegs in steam, gas, and air systems shall have drainage valves. Unions shall be provided at threaded valves, equipment, and other devices requiring occasional removal or disconnection.

D. **Branch Connections:** Branch connections in horizontal runs of air and gas piping shall be made from the top of the pipe, to avoid drainage of condensate into the equipment.

E. **Buried Pipe:** All pipe located in soil or concrete shall be properly protected from potential corrosion. Pipes with applied coatings shall be protected from damage during installation, including 20 mil PVC/PE plastic tape wrap, sand bedding and backfill, and other protective measures as needed depending on the method of cover. Contractor shall ensure mechanical compaction will not damage coatings. Pipes with epoxy coatings shall be carefully inspected for any damage prior to installation and repaired in accordance with the coating manufacturer's recommendations. Protect ends of pipe with blind flanges.

3.2 PIPE PREPARATION

A. Prior to installation, each pipe length shall be carefully inspected, be flushed clean of any debris or dust, and be straightened if not true. Ends of threaded pipes shall be reamed and filed smooth. All pipe fittings shall be equally cleaned before assemblage.

3.3 PIPE JOINTS

A. **Threaded Joints:** Pipe threads shall conform to ANSI/ASME B 1.20.1 - Pipe Threads,

General Purpose (inch), and shall be full and cleanly cut with sharp dies. Not more than three threads shall remain exposed after installation.

B. **Welded Joints:** Welded joints shall conform to the specifications and recommendations of ANSI/ASME B 31.1 - Power Piping. All welding shall be done by skilled and qualified welders per Section 15000 - Piping, General.

C. **Grooved Joints:** Grooves for grooved couplings and fittings shall be made with specially designed grooving tools to the Manufacturer's recommendations and conform to ANSI/AWWA C 606. All grooves shall be clean and sharp without flaws, and the pipe ends shall be accurately cut at 90 degrees to the pipe axis.

D. **Push On Joints:** Push on joints and gasket installation shall be in accordance with the Manufacturer's recommendations and lubricants. Pipe ends shall be beveled to facilitate assembly. Lubricants shall be suitable for potable water service and shall be kept clean in closed containers.

3.4 INSPECTION AND FIELD TESTING

A. **Inspection:** All finished installations shall be carefully inspected for proper supports, anchoring, interferences, and damage to pipe, fittings, and coating. Any damage shall be repaired to the satisfaction of the ENGINEER.

B. **Field Testing:** Prior to enclosure or burying, all piping systems shall be pressure tested as required in the Piping Schedule, for a period of not less than one hour, without exceeding the tolerances listed in the Piping Schedule. Where no pressures are indicated, the pipes shall be subject to 1-1/2 times the maximum working pressure. The CONTRACTOR shall furnish all test equipment, labor, materials, and devices at no extra cost to the OWNER. For additional testing requirements, refer to Section 02643 - Water Pipeline Testing and Disinfection.

6. Leakage may be determined by loss of pressure, soap solution, chemical indicator, or other positive and accurate method. All fixtures, devices, or other accessories which are to be connected to the lines and which would be damaged if subjected to the test pressure shall be disconnected and ends of the branch lines plugged or capped as required during the testing procedures.

7. After completion of the pressure tests, all chlorine gas piping shall be tested for leakage using chlorine gas under operating pressures. Piping shall be thoroughly clean and dry before admitting chlorine gas into the system. Chlorine shall be slowly admitted to the piping system. Leakage shall be checked with a swab soaked in aqua ammonia solution and waved in the vicinity of each fitting. Ammonia solution shall not be applied to the fittings. Formation of white fumes will be evidence of leaks. All chlorine gas shall be purged from the line before leaks are repaired.

8. Leaks shall be repaired to the satisfaction of the ENGINEER, and the system shall be re-tested until no leaks are found.

- END OF SECTION -

SECTION 15200 - VALVES, GENERAL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide all valves, actuators, and appurtenances, complete and operable, in accordance with the Contract Documents.

B. The requirements of Section 15000 apply to the WORK of this Section.

C. The provisions of this Section shall apply to all valves and valve actuators except where otherwise indicated. Valves and actuators in particular locations may require a combination of units, sensors, limit switches, and controls indicated in other Sections of the Specifications.

D. Not Used.

E. **Unit Responsibility:** A single manufacturer shall be made responsible for coordination of design, assembly, testing, and furnishing of each valve; however, the CONTRACTOR shall be responsible to the OWNER for compliance with the requirements of each valve section. Unless indicated otherwise, the responsible manufacturer shall be the manufacturer of the valve.

F. **Single Manufacturer:** Where two or more valves of the same type and size are required, the valves shall be furnished by the same manufacturer.

1.2 CONTRACTOR SUBMITTALS

A. **General:** Submittals shall be furnished in accordance with Section 01300 - Contractor Submittals.

B. **Shop Drawings:** Shop Drawings shall contain the following information:

1. Valve name, size, Cv factor, pressure rating, identification number (if any), and specification section number.

2. Complete information on valve actuator, including size, Manufacturer, model number, limit switches, and mounting.

3. Cavitation limits for all control valves.

4. Assembly drawings showing part nomenclature, materials, dimensions, weights, and relationships of valve handles, handwheels, position indicators, limit switches, integral control systems, needle valves, and control systems.

5. Not Used.

6. Complete wiring diagrams and control system schematics.

7. Valve Labeling: A schedule of valves to be furnished with stainless steel tags, ind

icating in each case the valve location and the proposed wording for the label.

C. **Technical Manual:** The Technical Manual shall contain the required information for each valve.

D. **Spare Parts List:** A Spare Parts List shall contain the required information for each valve assembly, where indicated.

E. **Factory Test Data:** Where indicated, signed, dated, and certified factory test data for each valve requiring certification shall be submitted before shipment of the valve. The data shall also include certification of quality and test results for factory-applied coatings.

PART 2 -- PRODUCTS

2.1 PRODUCTS

A. **General:** Valves and gates shall be new and of current manufacture. Shut-off valves 6-inches and larger shall have actuators with position indicators. Buried valves shall be provided with valve boxes and covers containing position indicators and valve extensions. Manual shut-off valves mounted higher than 7-feet above working level shall be provided with chain actuators.

B. **Valve Actuators:** Unless otherwise indicated, above-grade manual butterfly and gate valve actuators shall have handwheels, below grade manual valve actuators shall have operating nuts of size and installed per local agency construction standards.

C. **Valve Labeling:** Except when such requirement is waived by the ENGINEER in writing, a label shall be provided on all shut-off valves and control valves except for hose bibs and chlorine cylinder valves. The label shall be of 1/16-inch plastic or stainless steel, minimum 2 inches by 4 inches in size, and shall by permanently attached to the valve or on the wall adjacent to the valve as directed by the ENGINEER.

D. **Valve Testing:** As a minimum, unless otherwise indicated or recommended by the reference Standards, valves 3 inches in diameter and smaller shall be tested in accordance with manufacturer's standard and 4 inches in diameter and larger shall be factory tested as follows:

1. **Hydrostatic Testing:** Valve bodies shall be subjected to internal hydrostatic pressure equivalent to twice the water rated pressure of the valve. Metallic valves rating pressures shall be at 100 degrees F and plastic valves shall be 73 degrees, or at higher temperature according to type of material. During the hydrostatic test, there shall be no leakage through the valve body, end joints, or shaft seals, nor shall any part of the valve be permanently deformed. The duration shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes.

2. **Seat Testing:** Valves shall be tested for leaks in the closed position with the pressure differential across the seat equal to the water rated pressure of the valve. The duration of test shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes. Leakage past the closed valve shall not exceed 1 fluid ounce per hour per inch diameter for metal seated valves and drop-tight for resilient seated valves.

3. **Performance Testing:** All valves shall be shop operated from fully closed to fully open position and reverse under no-flow conditions in order to demonstrate the valve assembly operates properly.

E. **Certification:** Prior to shipment, the CONTRACTOR shall submit for valves over 12 inches in size, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, or ASTM.

F. **Valve Marking:** Valve bodies shall be permanently marked in accordance with MSS SP25 - Standard Marking Systems for Valves, Fittings, Flanges, and Unions.

2.2 MATERIALS

A. **General:** Materials shall be suitable for the intended application. Materials not indicated shall be high-grade standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended. Unless otherwise indicated, valve and actuator bodies shall conform to the following requirements:

1. **Cast Iron:** Close-grained gray cast iron, conforming to ASTM A 48 - Gray Iron Castings, Class 30, or to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

2. **Ductile Iron:** ASTM A 536 - Ductile Iron Castings, or to ASTM A 395 - Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

3. **Steel:** ASTM A 216 - Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Service, or to ASTM A 515 - Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service.

4. **Bronze:** ASTM B 62 - Composition Bronze or Ounce Metal Castings, and valve stems not subject to dezincification shall conform to ASTM B 584 - Copper Alloy Sand Castings for General Applications.

5. **Stainless Steel:** Stainless steel valve and operator bodies and trim shall conform to ASTM A 351 - Steel Castings, Austenitic, for High-Temperature Service, Grade CF8M, or shall be Type 316 stainless steel.

6. **PVC:** Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 12454.

7. **CPVC:** Chlorinated Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 23447.

8. **NSF Standard 14:** All materials shall be listed for use in contact with potable water.

2.3 VALVE CONSTRUCTION

A. **Bodies:** Valve bodies shall be cast, molded (in the case of plastic valves), forged, or welded of the materials indicated, with smooth interior passages. Wall thicknesses shall be uniform in agreement with the applicable standards for each type of valve, without casting defects, pinholes, or other defects that could weaken the body. Welds on welded bod

ies shall be done by certified welders and shall be ground smooth. Valve ends shall be as indicated, and be rated for the maximum temperature and pressure to which the valve will be subjected.

B. **Bonnets:** Valve bonnets shall be clamped, screwed, or flanged to the body and shall be of the same material, temperature, and pressure rating as the body. The bonnets shall have provision for the stem seal with the necessary glands, packing nuts, or yokes.

C. **Stems:** Valve stems shall be of the materials indicated, or, if not indicated, of the best commercial material for the specific service, with adjustable stem packing, O-rings, Chevron V-type packing, or other suitable seal. Where subject to dezincification, bronze valve stems shall conform to ASTM B 62, containing not more than 5 percent of zinc or more than 2 percent of aluminum, with a minimum tensile strength of 30,000 psi, a minimum yield strength of 14,000 psi, and an elongation of at least 10 percent in 2 inches. Where dezincification is not a problem, bronze conforming to ASTM B 584 may be used, except that zinc content shall not exceed 16 percent.

D. **Stem Guides:** Stem guides shall be provided, spaced 10-feet on centers unless the manufacturer can demonstrate by calculation that a different spacing is acceptable. Submerged stem guides shall be 304 stainless steel.

E. **Internal Parts:** Internal parts and valve trim shall be as indicated for each individual valve. Where not indicated, valve trim shall be of Type 316 stainless steel or other best suited material.

F. **Nuts and Bolts:** Nuts and bolts on valve flanges and supports shall be in accordance with Section 05500 - Miscellaneous Metalwork.

2.4 VALVE ACCESSORIES

A. Valves shall be furnished complete with the accessories required to provide a functional system.

2.5 SPARE PARTS

A. The CONTRACTOR shall furnish the required spare parts suitably packaged and labeled with the valve name, location, and identification number. The CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for the spare parts of each valve. Spare parts are intended for use by the OWNER, after expiration of the correction of defects period.

2.6 MANUFACTURERS

A. **Manufacturer's Qualifications:** Valve manufacturers shall have a successful record of not less than 5 years in the manufacture of the valves indicated.

PART 3 -- EXECUTION

3.1 VALVE INSTALLATION

A. **General:** Valves, actuating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the Manufacturer's written instructions and as indicated. Gat

es shall be adequately braced to prevent warpage and bending under the intended use. Valves shall be firmly supported to avoid undue stresses on the pipe.

B. **Access:** Valves shall be installed with easy access for actuation, removal, and maintenance and to avoid interference between valve actuators and structural members, handrails, or other equipment.

C. **Valve Accessories:** Where combinations of valves, sensors, switches, and controls are indicated, the CONTRACTOR shall properly assemble and install such items so that systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on Shop Drawing submittals.

D. **Testing:** All valves 4" and larger shall be field tested after installation for proper sealing and torque, in accordance with City construction standards. Valves that require more than 25 ft-lbs for operation shall be removed and replaced.

- END OF SECTION -

SECTION 15202 - BUTTERFLY VALVES

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide butterfly valves and appurtenances, complete and operable, in accordance with the Contract Documents.

1.2 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall furnish submittals in accordance with Section 1300.

PART 2 -- PRODUCTS

2.1 BUTTERFLY VALVES (AWWA)

A. **General:** Butterfly valves for water working pressures up to 150 psi shall conform to ANSI/AWWA C504 - Rubber Seated Butterfly Valves, subject to the following requirements. Valves shall be of the size and class indicated. Flanged valves shall have ANSI 125-lb flanges. Shaft seals shall be designed for use with standard split-V type packing, or other acceptable seal. The interior passage of butterfly valves shall not have any obstructions or stops. The seats shall be positively clamped or bonded into the disc or body of the valve, but cartridge-type seats which rely on a high coefficient of friction for retention shall not be acceptable.

B. **Manual Actuators:** Acuators shall be rated according to ANSI/AWWA C504, including the torque requirements. Unless otherwise indicated, all above-grade manually-actuated butterfly valves shall be equipped with a handwheel and position indicator. Buried actuators shall have a 2" operating nut. Rising stem actuators are not permitted unless indicated.

C. **Worm Gear Actuators**: Valves, 30 inches and larger, as well as all submerged and buried valves, shall be equipped with worm-gear actuators, lubricated and sealed to prevent entry of dirt or water into the housing.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. All exposed butterfly valves shall be installed with a means of removing the complete valve assembly without dismantling the valve or operator.

B. Install buried valves in accordance with local public works construction standards. Open-close rotation shall be in accordance with local public works standards.

- END OF SECTION -

SECTION 15600 - ALTITUDE CONTROL VALVES – FOR ONE WAY FLOW

INTRODUCTION

This specification covers the design, manufacture, and testing of 2 in. (50 mm) through 36 in. (900 mm) Altitude Control Valves

PART 1 - GENERAL

1. All valves shall be rated at 150 psi minimum.

2. All valves shall be NSF certified.

3. Valve manufacturer shall provide factory certified representatives for start up and training.

4. The control valve shall be CLA-VAL Company Model No. 210-01**,** Altitude Control Valve for One Way Flow, as manufactured by Cla-Val Co., Costa Mesa, CA 92627-4416, or pre-approved equal.

PART 2 - PRODUCTS

2.01 ALTITUDE CONTROL VALVES – FOR ONE WAY FLOW

A. FUNCTION

The valve shall control the high-water level in reservoirs without the need for floats or other devices. It shall be a non-throttling type valve (either fully open or fully closed). The valve remains fully open; allowing normal flow to fill the reservoir until the maximum level shut-off point is reached and then closes drip tight at the set point. The valve automatically opens to refill the reservoir once the level drops a fixed distance below the high-water level. This valve is designed for one-way flow only.

B. MATERIALS

1. Material Specification for the Altitude Control Valves Main Valve as follows:

Component	Material
Body & Cover	Ductile Iron-ASTM A536
Main Valve Trim	Stainless Steel
Seat	Stainless Steel
Stem, Nut and Spring	Stainless Steel
Seal Disc	Buna-N® Rubber
Diaphragm	Nylon Reinforced Buna-N® Rubber
Internal Trim Parts	Stainless Steel: Bronze; Brass

End Detail	Flanged (1-1/2" – 36") Threaded (1" – 3") Grooved (1-1/2" – 8")
Pressure Rating	Class 150 lb. (250psi Max.) Class 300 lb. (400psi Max.)
Temperature Range	Water to 180°F
Any other wetted metallic parts	Stainless Steel; Bronze; Brass
Coating	Fusion Bonded Epoxy Coating (Interior and Exterior); ANSI / NSF 61 Approved / AWWA coating specifications C116-03.
Accessories	Limit switch (for open close position signal), inlet pressure gauge, opening speed control

C. MANUFACTURE

1. Main Valve:

   a. The main valve shall be hydraulically operated, single diaphragm actuated, globe or angle pattern. The valve shall consist of three major components; the body with seat installed, the cover with bearing installed and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating the operating pressure from line pressure. Packing glands, stuffing boxes and/or rolling diaphragm technology will not be permitted and there shall be no pistons operating the main valve or pilot controls. No fabrication or welding shall be used in the manufacturing process. Y-pattern valves shall not be permitted. Main valve shall comply with NSF/ANSI Standard 61 and certified lead free to NSF/ANSI 372 as a safe drinking water system component.

2. Main Valve End Connections:

   a. End Connections for control valve shall be flanged per ASME/ANSI B16.42, Class 150.

3. Main Valve Body:

   a. No separate chamber(s) below the diaphragm shall be allowed between the main valve cover and body. No fabrication or welding shall be used in the manufacturing process.

   b. 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 and forming a tight seal against a single removable seat insert. No O-ring type discs (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 discs 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 hours-glass shaped disc retainers shall be permitted, and no V-type or slotted-type disc guides shall be used.

c. The diaphragm assembly containing a non-magnetic stainless-steel stem; of sufficient diameter to withstand high hydraulic pressures and shall be fully guided at both ends by a bearing in the main valve cover and an integral bearing in the valve seat. The valve seat shall be a solid, one-piece design and shall have a minimum 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 the operating pressure from the line pressure. No bolts or cap screws shall be permitted for use in the construction of the diaphragm assembly.

d. The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm's 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 X per layer of nylon fabric and shall be cycled 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 opened or fully closed position. Bellofram type rolling diaphragms shall not be permitted.

e. The main valve seat and stem bearing in the valve cover shall be removable. The cover bearing and seat in the 6" and smaller size valve shall be threaded into the cover and body. The valve seat in the 8" and larger size valves shall be retained by flat head machine screws

for ease of maintenance. 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 guide 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. The valve shall be designed such that

both the cover assembly and internal diaphragm assembly can be disassembled and lifted vertically straight up from the top of a narrow opening/vault. Y-pattern valves shall not be permitted. The seat shall be of the solid one-piece design. Two piece seats or seat inserts shall not be permitted. Packing glands and/or stuffing boxes shall not be permitted.

4. Pilot Control System:

   a. The pilot control shall be of a diaphragm-actuated, three-way type that operates on the differential force between the height of the water in the reservoir and an adjustable spring- load. The spring-load shall be an arrangement of smaller springs on a plate within the control. When actuated, the pilot control shall vent the cover of the main valve to atmosphere through the internal working of the pilot control to open the valve wide. When the desired level in the reservoir is reached, the static height of the tank shall head through a Contractor supplied and installed plastic coated copper sensing line connected directly to the side of the reservoir with a welded coupling connection and brass shut-off valve. When the control shifts at high water level supply pressure shall be directed into the valve cover through the internal workings of the pilot control to close the valve. The pilot control senses the reservoir head by means of a sensing line connected between the pilot control and the reservoir. The pilot control shall be bracket mounted to the main valve. Sensing line shall be installed with a continuous positive slope to the tank. Provide 18” minimum cover on sensing line.

   b. A valve position indicator shall be installed on the main valve cover and shall consist of a brass indicator rod fastened to the main valve stem which moves up and down inside a clear Pyrex tube contained in a bar brass housing open on two sides to permit clear vision of the brass indicator rod.

   c. The pilot control system shall include a strainer, closing speed needle valve and all required control accessories, equipment, control tubing and fittings. The pilot system shall include isolation ball valves on sizes 4” and larger as standard equipment. Five different adjustment spring settings shall be available, in ranges of 5 to 200 feet. Pilot to be manufactured by control valve manufacturer.

5. Material Specification for Pilot Control System:

Component	Material
Altitude Pilot Control	
Pilots Body & Cover	Bronze, Low Lead
CuZn21Si3P or UNS C87850 Pilot Trim	Brass & Stainless Steel

Seals & Diaphragm	Nitrile
Connections	FNPT
Pressure rating	150 psi Max.
Temperature Range	Water to 180°F Max.
Control Tubing	Stainless Steel
Control Fittings	Stainless Steel

6. 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: 2008.
   c. For all control valves, the factory assembly shall include the complete main valve, pilot valve(s), and all associated accessories and control equipment.
   d. During factory assembly the control valve manufacturer shall make all necessary adjustments and correct any defects.

7. 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" long.
   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.

8. Factory Testing:

   a. Each control valve shall be factory tested.
   b. The Quality Management System of the factory shall be certified in accordance with ISO 9001: 2008
   c. Tests shall conform to approved test procedures.
   d. The standard factory tests shall include a valve body and cover

leakage test, seat leakage test and a stroke test. Control valves and pilot valves, in the partially open position, with both ends closed off with blind flanges (valves) and pipe plugs (pilots), shall be subject to an air test. The applied air pressure shall be 90 psi minimum. All air pressure tests shall be applied for a minimum of 15 minutes. No visible leakage is permitted through the valve seat, the pressure boundary walls of the valve body, valve cover, pilot body, pilot cover or the body-cover joint.

e. Control valve manufacturer shall, upon request, offer additional testing, such as high-pressure hydrostatic testing, positive material inspection testing, ferrite testing, liquid penetration inspection testing, magnetic particle examination testing and radiographic examination testing.

D. PRODUCT DATA

1. The following information shall be provided:

   a. Control Valve manufacturer's technical product data.

   b. Control Valve manufacturer's Installation, Operation and Maintenance manual (IOM).

2. Provide specific information on all optional features specified above and confirm that these items are provided.

3. The valve manufacturer shall be able to supply a complete line of complementary accessories and equipment for future modification to valve function if needed.

4. The control valve manufacturer shall provide a computerized cavitation analysis report which shows flow rate, differential pressure, and percentage of valve opening. Cv factor, system velocity, and if there will be cavitation damage.

5. The manufacturer must also provide valve noise levels according to International Standards over the flow range of the valve. Noise calculation program will be specific to the control valve manufacturer, and based upon tests conducted by a third party, independent laboratory and will be able to provide dBA values for octave band frequencies between 31.5 and 8000 Hz. (Valves with KO trim calculations are per another industry accepted standard without the octave band frequency noise levels). Generic, third party noise calculation for non-specific control valves will not be accepted.

PART 3 - EXECUTION

A. DELIVERY, STORAGE AND HANDLING

1. Packing and Shipping

a. Control valves specified herein shall be factory assembled. Any control valve appurtenances, accessories, parts and assemblies that are shipped unassembled shall be packaged and tagged in a manner that will protect the equipment from damage and facilitate the final assembly in the field.

b. Care shall be taken in loading, transporting and unloading to protect control valves, appurtenances, or coatings from damage. Equipment shall not be dropped. All control valves and appurtenances shall be examined before installation and no piece shall be installed which is found to be defective. Any damage(s) shall be repaired.

c. Prior to shipping, the control valves and all associated accessories shall be acceptably packaged and covered to prevent entry of foreign material.

d. All packaged control valves shall be shipped, remain covered and stored on site until they are installed and put into use.

B. INSTALLATION

1. Install altitude valve in accordance with manufacturer's instructions and recommendations.

C. FIELD TESTING

1. A direct factory representative shall be made available by the equipment supplier for start-up service, inspection and necessary adjustments.

D. WARRANTY

1. The Control Valve manufacturer shall warrant the valve to be free of defects in material and workmanship for a period of three years from date of shipment provided the valve is installed and used in accordance with all applicable instructions. Electrical components shall have a one-year warranty.

END OF SECTION

SECTION 15000 - PIPING, GENERAL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide all piping systems indicated, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section shall apply to all piping sections in Divisions 2 and 15 of the contract specifications.

C. The mechanical drawings define the general layout, configuration, routing, method of support, pipe size, and pipe type. The mechanical drawings are **not** pipe construction or fabrication drawings. It is the CONTRACTOR's responsibility to develop the details necessary to construct all mechanical piping systems, to accommodate the specific equipment provided, and to provide all spools, spacers, adapters, and connectors for a complete and functional system.

1.2 CONTRACTOR SUBMITTAL

A. **General:** Submittals shall be furnished in accordance with Section 01300 - Contractor Submittals.

B. **Shop Drawings:** Shop Drawings shall contain the following information:

1. Drawings: Layout drawings including all necessary dimensions, details, pipe joints, fittings, specials, bolts and nuts, gaskets, valves, appurtenances, anchors, guides, and material lists. Fabrication drawings shall indicate all spool pieces, spacers, adapters, connectors, fittings, and supports to accommodate the equipment and valves in a complete and functional system.

C. **Samples:** Performing and paying for sampling and testing as necessary for certifications are the CONTRACTOR'S responsibility.

D. Certifications

1. All necessary certificates, test reports, and affidavits of compliance shall be obtained by the CONTRACTOR.

2. A certification from the pipe fabricator that all pipes will be manufactured subject to the fabricator's or a recognized Quality Control Program. An outline of the program shall be submitted to the ENGINEER for review prior to the manufacture of any pipe.

PART 2 -- PRODUCTS

2.1 GENERAL

A. **Extent of Work:** Pipes, fittings, and appurtenances shall be provided in accordance with the requirements of the applicable Sections of Divisions 2 and 15 and as indicated.

B. **Pipe Supports:** Pipes shall be adequately supported, restrained, and anchored in

accordance with building codes, pipe manufacturer recommendations, and as indicated on the plans. Supports shall resist stresses created by a seismic load per IBC.

C. **Lining:** Application, thickness, and curing of pipe lining shall be in accordance with the applicable Sections of Division 2 and Division 9, unless otherwise indicated.

D. **Coating:** Application, thickness, and curing of pipe coating shall be in accordance with the applicable Sections of Division 2 and Division 9, unless otherwise indicated. Pipes above ground or in structures shall be field-coated in accordance with Section 09800 - Protective Coating.

E. **Pressure Rating:** Piping systems shall be designed for the maximum expected pressure. All piping shall be designed and tested for a minimum working pressure of 150 psi minimum.

F. **Inspection:** Pipe shall be subject to inspection at the place of manufacture. During the manufacture of the pipe, the ENGINEER shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with requirements.

G. **Tests:** Except where otherwise indicated, materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards. Welds shall be tested as indicated. The CONTRACTOR shall be responsible for performing material tests.

H. **Welding Requirements:** Welding procedures used to fabricate pipe shall be prequalified under the provisions of ANSI/AWS D1.1 - Structural Welding Code. Welding procedures shall be submitted for the ENGINEER'S review for longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.

I. **Welder Qualifications:** Welding shall be done by skilled welders and welding operators 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 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests. Qualification testing of welders and materials used during testing are part of the WORK.

2.2 PIPE FLANGES

A. **General:** Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise indicated. Attachment of the flanges to the pipe shall conform to the applicable requirements of ANSI/AWWA C207. Flange faces shall be perpendicular to the axis of the adjoining pipe. Flanges for miscellaneous small pipes shall be in accordance with the standards indicated for these pipes.

B. Pressure Ratings

1. 150 psi or less: Flanges shall conform to either ANSI/AWWA C207 - Steel Pipe Flanges for Waterworks Service--Sizes 4 In. Through 144 In., Class D, or ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings, 150-lb class.

2. 150 psi to 275 psi: Flanges shall conform to either ANSI/AWWA C207 Class E or Class F, or ANSI/ASME B16.5 150-lb class.

3. 275 psi to 700 psi: Flanges shall conform to ANSI/ASME B16.5, 300-lb class.

4. Selection based on test pressure: AWWA flanges shall not be exposed to test pressures grater than 125 percent of rated capacity. For higher test pressures, the next higher rated AWWA flange or an ANSI-rated flange shall be selected.

C. **Blind Flanges:** Blind flanges shall be in accordance with ANSI/AWWA C207, or as indicated for miscellaneous small pipes. Blind flanges for pipe sizes 12 inches and greater shall be provided with lifting eyes in form of welded or screwed eye bolts.

D. **Flange Coating:** Machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.

E. **Flange Bolts:** All hardware (bolts, nuts, washers, rods, etc.) shall be 300 or 400 series stainless steel. All washers shall have plastic or Teflon separators where they may make contact with fusion bonded coatings. Buried hardware shall be wrapped in plastic. Studs and bolts shall extend through the nuts a minimum of 1/4-inch. All-thread studs shall be used on all valve flange connections, where space restrictions preclude the use of regular bolts.

F. **Insulating Flanges:** Insulated flanges shall have bolt holes 1/4-inch diameter greater than the bolt diameter.

G. **Insulating Flange Sets:** Insulating flange sets shall be provided where indicated. Each insulating flange set shall consist of an insulating gasket, insulating sleeves and washers and a steel washer. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1-1/2-inch or smaller and shall be made of acetal resin. For bolt diameters larger than 1-1/2-inch, insulating sleeves and washers shall be 2-piece and shall be made of polyethylene or phenolic material. Steel washers shall be in accordance with ASTM A 325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength. Insulating gaskets shall be full-face.

H. **Flange Gaskets:** Gaskets for flanged joints shall be full-faced type, with material and thickness in accordance with ANSI/AWWA C207, suitable for temperatures to 700 degrees F, a pH of one to eleven, and pressures to 1000 psig. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange. Ring gaskets shall not be permitted, unless otherwise indicated.

I. Type of Pipe: Unless otherwise specified, site pipe materials shall conform to the schedule below:

Service	Size Range	Material
Sewer	4" to 10"	Per Owner Standards
Drainage	4" to 24"	Per Owner Standards
Water	3/4" to 2"	Copper/SS
Water	6" to 16""	WSP

All pipe shall be rated at no less than 150 psi working pressure.

Welded steel pipe minimum thickness shall be as follows:

8" to 14"	8 gauge
16"	3/16"

2.3 THREADED INSULATING CONNECTIONS

A. **General:** Threaded insulating bushings, unions, or couplings, as appropriate, shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are involved.

B. **Materials:** Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other non-conductive materials, and shall have ratings and properties to suit the service and loading conditions.

2.4 MECHANICAL-TYPE COUPLINGS (GROOVED OR BANDED PIPE)

A. **General:** Cast mechanical-type couplings shall be provided where indicated. The couplings shall conform to the requirements of ANSI/AWWA C606 - Grooved and Shouldered Joints. Bolts and nuts shall conform to Item 2.2E. Gaskets for mechanical-type couplings shall be compatible with the piping service and fluid utilized, in accordance with the coupling manufacturer's recommendations. The wall thickness of grooved piping shall conform with the coupling manufacturer's recommendations to suit the highest expected pressure. To avoid stress on equipment, equipment connections with mechanical-type couplings shall have rigid-grooved couplings or flexible type coupling with harness in sizes where rigid couplings are not available, unless thrust restraint is provided by other means. Mechanical-type couplings shall be bonded. The CONTRACTOR shall have the coupling manufacturer's service representative verify the correct choice and application of couplings and gaskets, and the workmanship, to assure a correct installation. To assure uniform and compatible piping components, all grooved fittings, couplings, and valves shall be from the same manufacturer.

2.5 SLEEVE-TYPE COUPLINGS

A. **Construction:** Sleeve-type couplings shall be provided where indicated, in accordance with ANSI/AWWA C219 - Standard for Bolted Sleeve-Type Couplings for Plain-End Pipe. Couplings shall be steel with steel bolts, without pipe stop. Couplings shall be of sizes to fit the pipe and fittings indicated. The middle ring shall be not less than 1/4-inch in thickness and shall be either 5 or 7 inches long for sizes up to and including 30 inches and 10 inches long for sizes greater than 30 inches, for standard steel couplings, and 16 inches long for long-sleeve couplings. The followers shall be single-piece contoured mill sections welded and cold-expanded as required for the middle rings, and of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Bolts and nuts shall conform to Item 2.2E. Buried sleeve-type couplings shall be epoxy-coated at the factory as indicated.

B. **Pipe Preparation:** Where indicated, the ends of the pipe shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.

C. Gaskets

1. Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," Grade 60, or equivalent suitable elastomer. The rubber in the gasket shall meet the following specifications:

    a. Color - Jet Black

    b. Surface - Non-blooming

    c. Durometer Hardness - 74 ? 5

    d. Tensile Strength - 1000 psi Minimum

    e. Elongation - 175 percent Minimum

2. The gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet the requirements of ASTM D 2000 - Classification System for Rubber Products in Automotive Applications, AA709Z, meeting Suffix B13 Grade 3, except as noted above. Gaskets shall be compatible with the piping service and fluid utilized.

D. **Insulating Couplings:** Where insulating couplings are required, both ends of the coupling shall have a wedge-shaped gasket which assembles over a rubber sleeve of an insulating compound in order to obtain insulation of all coupling metal parts from the pipe.

E. **Restrained Joints:** Sleeve-type couplings on pressure lines shall be harnessed unless thrust restraint is provided by other means. Harnesses shall be designed by the pipe manufacturer in accordance with Manual M11, or as indicated. Harness sets shall be designed for the maximum test pressure of the pipe in which they are installed.

2.6 FLEXIBLE CONNECTORS

A. **Low Temperatures:** Flexible connectors shall be installed in all piping connections to engines, blowers, compressors, and other vibrating equipment, and where indicated. Flexible connectors for service temperatures up to 180 degrees F shall be flanged, reinforced Neoprene or Butyl spools, rated for a working pressure of 40 to 150 psi, or reinforced, flanged duck and rubber, as best suited for the application. Flexible connectors for service temperatures above 180 degrees F shall be flanged, braided stainless steel spools with inner, annular, corrugated stainless steel hose, rated for minimum 150 psi working pressure, unless otherwise indicated. The connectors shall be a

minimum of 9 inches long, face-to-face flanges, unless otherwise indicated. The final material selection shall be approved by the manufacturer. The CONTRACTOR shall submit manufacturer's shop drawings and calculations.

B. **High Temperature:** Flexible connectors shall be installed in engine exhaust piping and where indicated. Connectors shall be sufficient to compensate for thermal expansion and contraction and also to isolate vibration between the engine and the exhaust piping system. Connectors shall be stainless steel bellows type, flanged, and rated for minimum 150 psi, 2000 degrees F.

2.7 EXPANSION JOINTS

A. Piping subject to expansion and contraction shall be provided with sufficient means to compensate for such movement without exertion of undue forces to equipment or structures. This may be accomplished with expansion loops, bellow-type expansion joints, or sliding-type expansion joints. Expansion joints shall be of stainless steel, monel, rubber, or other materials best suited for each individual service. The CONTRACTOR shall submit detailed calculations and manufacturer's Shop Drawings of all proposed expansion joints, piping layouts, and anchors and guides, including information on materials, temperature and pressure ratings.

2.8 PIPE THREADS

A. Pipe threads shall be in accordance with ANSI/ASME B1.20.1 - Pipe Threads, General Purpose (inch), and be made up with Teflon tape unless otherwise indicated.

2.9 PIPE INSULATION

A. Hot and cold liquid piping, flues, and engine exhaust piping shall be insulated as indicated, in accordance with the manufacturer's recommendations, contract documents, and local building codes and standards. No unprotected hot piping shall be within reach of operating personnel or other persons.

PART 3 -- EXECUTION

3.1 MATERIAL DELIVERY, STORAGE, AND PROTECTION

A. Piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground for protection against oxidation caused by ground contact. Defective or damaged materials shall be replaced with new materials.

3.2 GENERAL

A. Pipes, fittings, and appurtenances shall be installed in accordance with the requirements of the applicable Sections of Divisions 2 and 15.

B. **Lined Piping Systems:** The lining manufacturer shall take full responsibility for the complete, final product and its application. Pipe ends and joints of lined pipes at screwed flanges shall be epoxy-coated to assure continuous protection.

C. **Cleanup:** After completion of the WORK, cuttings, joining and wrapping materials, and

other scattered debris shall be removed from the Site. The entire piping system shall be handed over in a clean and functional condition.

- END OF SECTION -

SECTION 15025 - STEEL PIPE (TANK)
(ASTM A 53 / A 106, MODIFIED)

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide steel pipe and appurtenances, complete and in place, in accordance with the Contract Documents.

B. The plans define the general layout, configuration, routing, method of support, pipe size, and pipe type. The mechanical drawings are **not** pipe construction or fabrication drawings. It is the CONTRACTOR's responsibility to develop the details necessary to construct all mechanical piping systems, to accommodate the specific equipment provided, and to provide all spools, spacers, adapters, and connectors for a complete and functional system.

C. Shop Drawings for fabricated steel pipe submitted to the Engineer shall contain the following information:

Drawings: Layout drawings including all necessary dimensions, details, pipe joints, fittings, specials, bolts and nuts, gaskets, valves, appurtenances, anchors, guides, and material lists. Fabrication drawings shall indicate all spool pieces, spacers, adapters, connectors, fittings, and supports to accommodate the equipment and valves in a complete and functional system

D. All fabricated steel fittings and joints shall be factory tested for integrity in accordance with ASTM Non Destructive Testing Methods and Standards prior to application of coatings and linings. Testing methods shall be approved by Engineer. Testing shall be performed by an independent testing service, and results forwarded to the Owner.

PART 2 -- PRODUCTS

2.1 PIPE MATERIAL AND FABRICATION

A. **Water, Air, Fuel Gas, Oil, Steam, and Waste Service:** Unless otherwise indicated, galvanized and black steel pipe shall conform to ASTM A 53 - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless or ASTM A 106 - Specification for Seamless Carbon Steel Pipe for High Temperature Service, Grade B, and shall be Schedule 40 or 80, as indicated in the Piping Schedule. Galvanized steel pipe shall not be cement mortar lined unless so indicated.

Welding Requirements: Welding procedures used to fabricate pipe shall be prequalified under the provisions of ANSI/AWS D1.1 - Structural Welding Code.

Welder Qualifications: Welding shall be done by skilled welders and welding operators 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 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests. Qualification testing of welders and materials used during testing are

part of the WORK.

2.2 PIPE JOINTS

A. Small diameter black steel pipe (3" or smaller) for general service shall have screwed ends with NPT threads, welded joints, or flanged joints. Screwed joints shall be made up with Teflon tape and welded joints may have butt-weld fittings, socket-weld fittings, or flanges. Where indicated, black steel pipe shall have grooved ends for shouldered couplings or plain ends for sleeve-type couplings.

B. Large diameter steel pipe (4" and larger) shall be have fabricated welded steel flanged joints. No mechanical joints shall be allowed within 15' of tank. All joints within 15' of tank perimeter shall be fully restrained.

C. Galvanized steel pipe shall have screwed ends with NPT threads made up with Teflon tape. Where indicated, galvanized steel pipe shall have grooved ends for shouldered couplings or plain ends for sleeve-type couplings. Connect galvanized pipe without "wrench bites". Galvanized coatings damaged during installation shall be replaced. Do not coat galvanized pipe unless shown on plans.

D. Mechanical joints shall use 316 SS bolts and hardware. All buried joints shall be protected with PE encasement (plastic wrap) in accordance with AWWA C105.

2.3 FITTINGS

A. **Common Use:** The following fittings shall be provided for galvanized or black steel pipe, as indicated in the Piping Schedule:

1. Threaded malleable iron fittings conforming to ANSI/ASME B 16.3 - Malleable-Iron Threaded Fittings, Classes 150 and 300.

2. Threaded cast iron fittings conforming to ANSI/ASME B 16.4 - Cast Iron Threaded Fittings, Class 125 and 250.

3. Forged steel socket welded fittings conforming to ANSI/ASME B 16.11 - Forged Fittings, Socket - Welding and Threaded.

4. Butt welding fittings conforming to ANSI/ASME B 16.9 - Factory-Made Wrought Steel Butt Welding Fittings, Schedule 40 or 80, as indicated.

B. SLEEVE-TYPE COUPLINGS

1. **Construction:** Sleeve-type couplings shall be provided where indicated, in accordance with ANSI/AWWA C219 - Standard for Bolted Sleeve-Type Couplings for Plain-End Pipe. Couplings shall be steel with stainless steel bolts and nuts, without pipe stop. Couplings shall be of sizes to fit the pipe and fittings indicated. The middle ring shall be not less than 1/4-inch in thickness and shall be either 5 or 7 inches long. The followers shall be single-piece contoured mill sections welded and cold-expanded as required for the middle rings, and of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to

provide positive confinement of the gasket. Buried sleeve-type couplings shall be epoxy-coated at the factory as indicated.

2. **Pipe Preparation:** Where indicated, the ends of the pipe shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.

C. PIPE FLANGES

Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise indicated. Attachment of the flanges to the pipe shall conform to the applicable requirements of ANSI/AWWA C207. Flange faces shall be perpendicular to the axis of the adjoining pipe. Flanges for miscellaneous small pipes shall be in accordance with the standards indicated for these pipes.

D. GASKETS

1. Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," Grade 60, or equivalent suitable elastomer. The rubber in the gasket shall meet the following specifications:

   a. Color - Jet Black

   b. Surface - Non-blooming

   c. Durometer Hardness - 74 5

   d. Tensile Strength - 1000 psi Minimum

   e. Elongation - 175 percent Minimum

2. The gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet the requirements of ASTM D 2000 - Classification System for Rubber Products in Automotive Applications, AA709Z, meeting Suffix B13 Grade 3, except as noted above. Gaskets shall be compatible with the piping service and fluid utilized.

E. COATINGS AND LININGS

Steel pipe coating/lining material shall be a 100 percent powder epoxy, certified as compliant with NSF Standard 61, applied in accordance with the ANSI/AWWA C213 - Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines, except that the surface preparation shall be as specified in the coating system schedule of this Section. The coating shall be applied using the fluidized bed or electrostatic spray process.

3. Coating DFT = 16 mils, **Scotchkote 134 or 206N, or equal.**

4. For coating of valves, DFT - 12 mils.

5. Liquid Epoxy: For field repairs, the use of a liquid epoxy will be permitted, applied in not less than 3 coats to provide a DFT of 15 mils. The liquid epoxy shall be a 100 percent solids epoxy recommended by the powder epoxy manufacturer.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. **General:** All steel pipes shall be installed in a neat and workmanlike manner, properly aligned, and cut from measurements taken at the site, to avoid interferences with structural members, architectural features, openings, and equipment. Exposed pipes shall afford maximum headroom and access to equipment, and where necessary, all piping shall be installed with sufficient slopes for venting or drainage of liquids and condensate to low points. All installations shall be acceptable to the ENGINEER.

B. **Supports and Anchors:** All piping shall be firmly supported with fabricated or commercial hangers or supports in accordance with Section 15006 - Pipe Supports. Where necessary to avoid stress on equipment or structural members, the pipes shall be anchored or harnessed. Expansion joints and guides shall compensate for pipe expansion due to temperature differences.

C. **Valves and Unions:** Water, steam, condensate, gas, vacuum, and air supply piping to fixtures, groups of fixtures, and equipment shall be provided with a shutoff valve and union, unless the valve has flanged ends. Low points in water systems and driplegs in steam, gas, and air systems shall have drainage valves. Unions shall be provided at threaded valves, equipment, and other devices requiring occasional removal or disconnection.

D. **Branch Connections:** Branch connections in horizontal runs of air and gas piping shall be made from the top of the pipe, to avoid drainage of condensate into the equipment.

E. **Buried Pipe:** All pipe located in soil or concrete shall be properly protected from potential corrosion. Pipes with applied coatings shall be protected from damage during installation, including 20 mil PVC/PE plastic tape wrap, sand bedding and backfill, and other protective measures as needed depending on the method of cover. Contractor shall ensure mechanical compaction will not damage coatings. Pipes with epoxy coatings shall be carefully inspected for any damage prior to installation and repaired in accordance with the coating manufacturer's recommendations. Protect ends of pipe with blind flanges.

3.2 PIPE PREPARATION

A. Prior to installation, each pipe length shall be carefully inspected, be flushed clean of any debris or dust, and be straightened if not true. Ends of threaded pipes shall be reamed and filed smooth. All pipe fittings shall be equally cleaned before assemblage.

3.3 PIPE JOINTS

A. **Threaded Joints:** Pipe threads shall conform to ANSI/ASME B 1.20.1 - Pipe Threads,

General Purpose (inch), and shall be full and cleanly cut with sharp dies. Not more than three threads shall remain exposed after installation.

B. **Welded Joints:** Welded joints shall conform to the specifications and recommendations of ANSI/ASME B 31.1 - Power Piping. All welding shall be done by skilled and qualified welders per Section 15000 - Piping, General.

C. **Grooved Joints:** Grooves for grooved couplings and fittings shall be made with specially designed grooving tools to the Manufacturer's recommendations and conform to ANSI/AWWA C 606. All grooves shall be clean and sharp without flaws, and the pipe ends shall be accurately cut at 90 degrees to the pipe axis.

D. **Push On Joints:** Push on joints and gasket installation shall be in accordance with the Manufacturer's recommendations and lubricants. Pipe ends shall be beveled to facilitate assembly. Lubricants shall be suitable for potable water service and shall be kept clean in closed containers.

3.4 INSPECTION AND FIELD TESTING

A. **Inspection:** All finished installations shall be carefully inspected for proper supports, anchoring, interferences, and damage to pipe, fittings, and coating. Any damage shall be repaired to the satisfaction of the ENGINEER.

B. **Field Testing:** Prior to enclosure or burying, all piping systems shall be pressure tested as required in the Piping Schedule, for a period of not less than one hour, without exceeding the tolerances listed in the Piping Schedule. Where no pressures are indicated, the pipes shall be subject to 1-1/2 times the maximum working pressure. The CONTRACTOR shall furnish all test equipment, labor, materials, and devices at no extra cost to the OWNER. For additional testing requirements, refer to Section 02643 - Water Pipeline Testing and Disinfection.

6. Leakage may be determined by loss of pressure, soap solution, chemical indicator, or other positive and accurate method. All fixtures, devices, or other accessories which are to be connected to the lines and which would be damaged if subjected to the test pressure shall be disconnected and ends of the branch lines plugged or capped as required during the testing procedures.

7. After completion of the pressure tests, all chlorine gas piping shall be tested for leakage using chlorine gas under operating pressures. Piping shall be thoroughly clean and dry before admitting chlorine gas into the system. Chlorine shall be slowly admitted to the piping system. Leakage shall be checked with a swab soaked in aqua ammonia solution and waved in the vicinity of each fitting. Ammonia solution shall not be applied to the fittings. Formation of white fumes will be evidence of leaks. All chlorine gas shall be purged from the line before leaks are repaired.

8. Leaks shall be repaired to the satisfaction of the ENGINEER, and the system shall be re-tested until no leaks are found.

- END OF SECTION -

SECTION 15200 - VALVES, GENERAL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide all valves, actuators, and appurtenances, complete and operable, in accordance with the Contract Documents.

B. The requirements of Section 15000 apply to the WORK of this Section.

C. The provisions of this Section shall apply to all valves and valve actuators except where otherwise indicated. Valves and actuators in particular locations may require a combination of units, sensors, limit switches, and controls indicated in other Sections of the Specifications.

D. Not Used.

E. **Unit Responsibility:** A single manufacturer shall be made responsible for coordination of design, assembly, testing, and furnishing of each valve; however, the CONTRACTOR shall be responsible to the OWNER for compliance with the requirements of each valve section. Unless indicated otherwise, the responsible manufacturer shall be the manufacturer of the valve.

F. **Single Manufacturer:** Where two or more valves of the same type and size are required, the valves shall be furnished by the same manufacturer.

1.2 CONTRACTOR SUBMITTALS

A. **General:** Submittals shall be furnished in accordance with Section 01300 - Contractor Submittals.

B. **Shop Drawings:** Shop Drawings shall contain the following information:

1. Valve name, size, Cv factor, pressure rating, identification number (if any), and specification section number.

2. Complete information on valve actuator, including size, Manufacturer, model number, limit switches, and mounting.

3. Cavitation limits for all control valves.

4. Assembly drawings showing part nomenclature, materials, dimensions, weights, and relationships of valve handles, handwheels, position indicators, limit switches, integral control systems, needle valves, and control systems.

5. Not Used.

6. Complete wiring diagrams and control system schematics.

7. Valve Labeling: A schedule of valves to be furnished with stainless steel tags, ind

icating in each case the valve location and the proposed wording for the label.

C. **Technical Manual:** The Technical Manual shall contain the required information for each valve.

D. **Spare Parts List:** A Spare Parts List shall contain the required information for each valve assembly, where indicated.

E. **Factory Test Data:** Where indicated, signed, dated, and certified factory test data for each valve requiring certification shall be submitted before shipment of the valve. The data shall also include certification of quality and test results for factory-applied coatings.

PART 2 -- PRODUCTS

2.1 PRODUCTS

A. **General:** Valves and gates shall be new and of current manufacture. Shut-off valves 6-inches and larger shall have actuators with position indicators. Buried valves shall be provided with valve boxes and covers containing position indicators and valve extensions. Manual shut-off valves mounted higher than 7-feet above working level shall be provided with chain actuators.

B. **Valve Actuators:** Unless otherwise indicated, above-grade manual butterfly and gate valve actuators shall have handwheels, below grade manual valve actuators shall have operating nuts of size and installed per local agency construction standards.

C. **Valve Labeling:** Except when such requirement is waived by the ENGINEER in writing, a label shall be provided on all shut-off valves and control valves except for hose bibs and chlorine cylinder valves. The label shall be of 1/16-inch plastic or stainless steel, minimum 2 inches by 4 inches in size, and shall by permanently attached to the valve or on the wall adjacent to the valve as directed by the ENGINEER.

D. **Valve Testing:** As a minimum, unless otherwise indicated or recommended by the reference Standards, valves 3 inches in diameter and smaller shall be tested in accordance with manufacturer's standard and 4 inches in diameter and larger shall be factory tested as follows:

1. **Hydrostatic Testing:** Valve bodies shall be subjected to internal hydrostatic pressure equivalent to twice the water rated pressure of the valve. Metallic valves rating pressures shall be at 100 degrees F and plastic valves shall be 73 degrees, or at higher temperature according to type of material. During the hydrostatic test, there shall be no leakage through the valve body, end joints, or shaft seals, nor shall any part of the valve be permanently deformed. The duration shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes.

2. **Seat Testing:** Valves shall be tested for leaks in the closed position with the pressure differential across the seat equal to the water rated pressure of the valve. The duration of test shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes. Leakage past the closed valve shall not exceed 1 fluid ounce per hour per inch diameter for metal seated valves and drop-tight for resilient seated valves.

3. **Performance Testing:** All valves shall be shop operated from fully closed to fully open position and reverse under no-flow conditions in order to demonstrate the valve assembly operates properly.

E. **Certification:** Prior to shipment, the CONTRACTOR shall submit for valves over 12 inches in size, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, or ASTM.

F. **Valve Marking:** Valve bodies shall be permanently marked in accordance with MSS SP25 - Standard Marking Systems for Valves, Fittings, Flanges, and Unions.

2.2 MATERIALS

A. **General:** Materials shall be suitable for the intended application. Materials not indicated shall be high-grade standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended. Unless otherwise indicated, valve and actuator bodies shall conform to the following requirements:

1. **Cast Iron:** Close-grained gray cast iron, conforming to ASTM A 48 - Gray Iron Castings, Class 30, or to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

2. **Ductile Iron:** ASTM A 536 - Ductile Iron Castings, or to ASTM A 395 - Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

3. **Steel:** ASTM A 216 - Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Service, or to ASTM A 515 - Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service.

4. **Bronze:** ASTM B 62 - Composition Bronze or Ounce Metal Castings, and valve stems not subject to dezincification shall conform to ASTM B 584 - Copper Alloy Sand Castings for General Applications.

5. **Stainless Steel:** Stainless steel valve and operator bodies and trim shall conform to ASTM A 351 - Steel Castings, Austenitic, for High-Temperature Service, Grade CF8M, or shall be Type 316 stainless steel.

6. **PVC:** Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 12454.

7. **CPVC:** Chlorinated Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 23447.

8. **NSF Standard 14:** All materials shall be listed for use in contact with potable water.

2.3 VALVE CONSTRUCTION

A. **Bodies:** Valve bodies shall be cast, molded (in the case of plastic valves), forged, or welded of the materials indicated, with smooth interior passages. Wall thicknesses shall be uniform in agreement with the applicable standards for each type of valve, without casting defects, pinholes, or other defects that could weaken the body. Welds on welded bod

ies shall be done by certified welders and shall be ground smooth. Valve ends shall be as indicated, and be rated for the maximum temperature and pressure to which the valve will be subjected.

B. **Bonnets:** Valve bonnets shall be clamped, screwed, or flanged to the body and shall be of the same material, temperature, and pressure rating as the body. The bonnets shall have provision for the stem seal with the necessary glands, packing nuts, or yokes.

C. **Stems:** Valve stems shall be of the materials indicated, or, if not indicated, of the best commercial material for the specific service, with adjustable stem packing, O-rings, Chevron V-type packing, or other suitable seal. Where subject to dezincification, bronze valve stems shall conform to ASTM B 62, containing not more than 5 percent of zinc or more than 2 percent of aluminum, with a minimum tensile strength of 30,000 psi, a minimum yield strength of 14,000 psi, and an elongation of at least 10 percent in 2 inches. Where dezincification is not a problem, bronze conforming to ASTM B 584 may be used, except that zinc content shall not exceed 16 percent.

D. **Stem Guides:** Stem guides shall be provided, spaced 10-feet on centers unless the manufacturer can demonstrate by calculation that a different spacing is acceptable. Submerged stem guides shall be 304 stainless steel.

E. **Internal Parts:** Internal parts and valve trim shall be as indicated for each individual valve. Where not indicated, valve trim shall be of Type 316 stainless steel or other best suited material.

F. **Nuts and Bolts:** Nuts and bolts on valve flanges and supports shall be in accordance with Section 05500 - Miscellaneous Metalwork.

2.4 VALVE ACCESSORIES

A. Valves shall be furnished complete with the accessories required to provide a functional system.

2.5 SPARE PARTS

A. The CONTRACTOR shall furnish the required spare parts suitably packaged and labeled with the valve name, location, and identification number. The CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for the spare parts of each valve. Spare parts are intended for use by the OWNER, after expiration of the correction of defects period.

2.6 MANUFACTURERS

A. **Manufacturer's Qualifications:** Valve manufacturers shall have a successful record of not less than 5 years in the manufacture of the valves indicated.

PART 3 -- EXECUTION

3.1 VALVE INSTALLATION

A. **General:** Valves, actuating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the Manufacturer's written instructions and as indicated. Gat

es shall be adequately braced to prevent warpage and bending under the intended use. Valves shall be firmly supported to avoid undue stresses on the pipe.

B. **Access:** Valves shall be installed with easy access for actuation, removal, and maintenance and to avoid interference between valve actuators and structural members, handrails, or other equipment.

C. **Valve Accessories:** Where combinations of valves, sensors, switches, and controls are indicated, the CONTRACTOR shall properly assemble and install such items so that systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on Shop Drawing submittals.

D. **Testing:** All valves 4" and larger shall be field tested after installation for proper sealing and torque, in accordance with City construction standards. Valves that require more than 25 ft-lbs for operation shall be removed and replaced.

- END OF SECTION -

SECTION 15202 - BUTTERFLY VALVES

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide butterfly valves and appurtenances, complete and operable, in accordance with the Contract Documents.

1.2 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall furnish submittals in accordance with Section 1300.

PART 2 -- PRODUCTS

2.1 BUTTERFLY VALVES (AWWA)

A. **General:** Butterfly valves for water working pressures up to 150 psi shall conform to ANSI/AWWA C504 - Rubber Seated Butterfly Valves, subject to the following requirements. Valves shall be of the size and class indicated. Flanged valves shall have ANSI 125-lb flanges. Shaft seals shall be designed for use with standard split-V type packing, or other acceptable seal. The interior passage of butterfly valves shall not have any obstructions or stops. The seats shall be positively clamped or bonded into the disc or body of the valve, but cartridge-type seats which rely on a high coefficient of friction for retention shall not be acceptable.

B. **Manual Actuators:** Acuators shall be rated according to ANSI/AWWA C504, including the torque requirements. Unless otherwise indicated, all above-grade manually-actuated butterfly valves shall be equipped with a handwheel and position indicator. Buried actuators shall have a 2" operating nut. Rising stem actuators are not permitted unless indicated.

C. **Worm Gear Actuators**: Valves, 30 inches and larger, as well as all submerged and buried valves, shall be equipped with worm-gear actuators, lubricated and sealed to prevent entry of dirt or water into the housing.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. All exposed butterfly valves shall be installed with a means of removing the complete valve assembly without dismantling the valve or operator.

B. Install buried valves in accordance with local public works construction standards. Open-close rotation shall be in accordance with local public works standards.

- END OF SECTION -

SECTION 15600 - ALTITUDE CONTROL VALVES – FOR ONE WAY FLOW

INTRODUCTION

This specification covers the design, manufacture, and testing of 2 in. (50 mm) through 36 in. (900 mm) Altitude Control Valves

PART 1 - GENERAL

1. All valves shall be rated at 150 psi minimum.

2. All valves shall be NSF certified.

3. Valve manufacturer shall provide factory certified representatives for start up and training.

4. The control valve shall be CLA-VAL Company Model No. 210-01**,** Altitude Control Valve for One Way Flow, as manufactured by Cla-Val Co., Costa Mesa, CA 92627-4416, or pre-approved equal.

PART 2 - PRODUCTS

2.01 ALTITUDE CONTROL VALVES – FOR ONE WAY FLOW

A. FUNCTION

The valve shall control the high-water level in reservoirs without the need for floats or other devices. It shall be a non-throttling type valve (either fully open or fully closed). The valve remains fully open; allowing normal flow to fill the reservoir until the maximum level shut-off point is reached and then closes drip tight at the set point. The valve automatically opens to refill the reservoir once the level drops a fixed distance below the high-water level. This valve is designed for one-way flow only.

B. MATERIALS

1. Material Specification for the Altitude Control Valves Main Valve as follows:

Component	Material
Body & Cover	Ductile Iron-ASTM A536
Main Valve Trim	Stainless Steel
Seat	Stainless Steel
Stem, Nut and Spring	Stainless Steel
Seal Disc	Buna-N® Rubber
Diaphragm	Nylon Reinforced Buna-N® Rubber
Internal Trim Parts	Stainless Steel: Bronze; Brass

End Detail	Flanged (1-1/2" – 36") Threaded (1" – 3") Grooved (1-1/2" – 8")
Pressure Rating	Class 150 lb. (250psi Max.) Class 300 lb. (400psi Max.)
Temperature Range	Water to 180°F
Any other wetted metallic parts	Stainless Steel; Bronze; Brass
Coating	Fusion Bonded Epoxy Coating (Interior and Exterior); ANSI / NSF 61 Approved / AWWA coating specifications C116-03.
Accessories	Limit switch (for open close position signal), inlet pressure gauge, opening speed control

C. MANUFACTURE

1. Main Valve:

   a. The main valve shall be hydraulically operated, single diaphragm actuated, globe or angle pattern. The valve shall consist of three major components; the body with seat installed, the cover with bearing installed and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating the operating pressure from line pressure. Packing glands, stuffing boxes and/or rolling diaphragm technology will not be permitted and there shall be no pistons operating the main valve or pilot controls. No fabrication or welding shall be used in the manufacturing process. Y-pattern valves shall not be permitted. Main valve shall comply with NSF/ANSI Standard 61 and certified lead free to NSF/ANSI 372 as a safe drinking water system component.

2. Main Valve End Connections:

   a. End Connections for control valve shall be flanged per ASME/ANSI B16.42, Class 150.

3. Main Valve Body:

   a. No separate chamber(s) below the diaphragm shall be allowed between the main valve cover and body. No fabrication or welding shall be used in the manufacturing process.

   b. 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 and forming a tight seal against a single removable seat insert. No O-ring type discs (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 discs 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 hours-glass shaped disc retainers shall be permitted, and no V-type or slotted-type disc guides shall be used.

c. The diaphragm assembly containing a non-magnetic stainless-steel stem; of sufficient diameter to withstand high hydraulic pressures and shall be fully guided at both ends by a bearing in the main valve cover and an integral bearing in the valve seat. The valve seat shall be a solid, one-piece design and shall have a minimum 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 the operating pressure from the line pressure. No bolts or cap screws shall be permitted for use in the construction of the diaphragm assembly.

d. The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm's 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 X per layer of nylon fabric and shall be cycled 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 opened or fully closed position. Bellofram type rolling diaphragms shall not be permitted.

e. The main valve seat and stem bearing in the valve cover shall be removable. The cover bearing and seat in the 6" and smaller size valve shall be threaded into the cover and body. The valve seat in the 8" and larger size valves shall be retained by flat head machine screws

for ease of maintenance. 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 guide 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. The valve shall be designed such that

both the cover assembly and internal diaphragm assembly can be disassembled and lifted vertically straight up from the top of a narrow opening/vault. Y-pattern valves shall not be permitted. The seat shall be of the solid one-piece design. Two piece seats or seat inserts shall not be permitted. Packing glands and/or stuffing boxes shall not be permitted.

4. Pilot Control System:

   a. The pilot control shall be of a diaphragm-actuated, three-way type that operates on the differential force between the height of the water in the reservoir and an adjustable spring- load. The spring-load shall be an arrangement of smaller springs on a plate within the control. When actuated, the pilot control shall vent the cover of the main valve to atmosphere through the internal working of the pilot control to open the valve wide. When the desired level in the reservoir is reached, the static height of the tank shall head through a Contractor supplied and installed plastic coated copper sensing line connected directly to the side of the reservoir with a welded coupling connection and brass shut-off valve. When the control shifts at high water level supply pressure shall be directed into the valve cover through the internal workings of the pilot control to close the valve. The pilot control senses the reservoir head by means of a sensing line connected between the pilot control and the reservoir. The pilot control shall be bracket mounted to the main valve. Sensing line shall be installed with a continuous positive slope to the tank. Provide 18” minimum cover on sensing line.

   b. A valve position indicator shall be installed on the main valve cover and shall consist of a brass indicator rod fastened to the main valve stem which moves up and down inside a clear Pyrex tube contained in a bar brass housing open on two sides to permit clear vision of the brass indicator rod.

   c. The pilot control system shall include a strainer, closing speed needle valve and all required control accessories, equipment, control tubing and fittings. The pilot system shall include isolation ball valves on sizes 4” and larger as standard equipment. Five different adjustment spring settings shall be available, in ranges of 5 to 200 feet. Pilot to be manufactured by control valve manufacturer.

5. Material Specification for Pilot Control System:

Component	Material
Altitude Pilot Control	
Pilots Body & Cover	Bronze, Low Lead
CuZn21Si3P or UNS C87850 Pilot Trim	Brass & Stainless Steel

Seals & Diaphragm	Nitrile
Connections	FNPT
Pressure rating	150 psi Max.
Temperature Range	Water to 180°F Max.
Control Tubing	Stainless Steel
Control Fittings	Stainless Steel

6. 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: 2008.
   c. For all control valves, the factory assembly shall include the complete main valve, pilot valve(s), and all associated accessories and control equipment.
   d. During factory assembly the control valve manufacturer shall make all necessary adjustments and correct any defects.

7. 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" long.
   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.

8. Factory Testing:

   a. Each control valve shall be factory tested.
   b. The Quality Management System of the factory shall be certified in accordance with ISO 9001: 2008
   c. Tests shall conform to approved test procedures.
   d. The standard factory tests shall include a valve body and cover

leakage test, seat leakage test and a stroke test. Control valves and pilot valves, in the partially open position, with both ends closed off with blind flanges (valves) and pipe plugs (pilots), shall be subject to an air test. The applied air pressure shall be 90 psi minimum. All air pressure tests shall be applied for a minimum of 15 minutes. No visible leakage is permitted through the valve seat, the pressure boundary walls of the valve body, valve cover, pilot body, pilot cover or the body-cover joint.

e. Control valve manufacturer shall, upon request, offer additional testing, such as high-pressure hydrostatic testing, positive material inspection testing, ferrite testing, liquid penetration inspection testing, magnetic particle examination testing and radiographic examination testing.

D. PRODUCT DATA

1. The following information shall be provided:

   a. Control Valve manufacturer's technical product data.

   b. Control Valve manufacturer's Installation, Operation and Maintenance manual (IOM).

2. Provide specific information on all optional features specified above and confirm that these items are provided.

3. The valve manufacturer shall be able to supply a complete line of complementary accessories and equipment for future modification to valve function if needed.

4. The control valve manufacturer shall provide a computerized cavitation analysis report which shows flow rate, differential pressure, and percentage of valve opening. Cv factor, system velocity, and if there will be cavitation damage.

5. The manufacturer must also provide valve noise levels according to International Standards over the flow range of the valve. Noise calculation program will be specific to the control valve manufacturer, and based upon tests conducted by a third party, independent laboratory and will be able to provide dBA values for octave band frequencies between 31.5 and 8000 Hz. (Valves with KO trim calculations are per another industry accepted standard without the octave band frequency noise levels). Generic, third party noise calculation for non-specific control valves will not be accepted.

PART 3 - EXECUTION

A. DELIVERY, STORAGE AND HANDLING

1. Packing and Shipping

a. Control valves specified herein shall be factory assembled. Any control valve appurtenances, accessories, parts and assemblies that are shipped unassembled shall be packaged and tagged in a manner that will protect the equipment from damage and facilitate the final assembly in the field.

b. Care shall be taken in loading, transporting and unloading to protect control valves, appurtenances, or coatings from damage. Equipment shall not be dropped. All control valves and appurtenances shall be examined before installation and no piece shall be installed which is found to be defective. Any damage(s) shall be repaired.

c. Prior to shipping, the control valves and all associated accessories shall be acceptably packaged and covered to prevent entry of foreign material.

d. All packaged control valves shall be shipped, remain covered and stored on site until they are installed and put into use.

B. INSTALLATION

1. Install altitude valve in accordance with manufacturer's instructions and recommendations.

C. FIELD TESTING

1. A direct factory representative shall be made available by the equipment supplier for start-up service, inspection and necessary adjustments.

D. WARRANTY

1. The Control Valve manufacturer shall warrant the valve to be free of defects in material and workmanship for a period of three years from date of shipment provided the valve is installed and used in accordance with all applicable instructions. Electrical components shall have a one-year warranty.

END OF SECTION