



**BROWNSVILLE PUBLIC UTILITIES BOARD
BROWNSVILLE, TEXAS**

WTP NO. 2 FLOCCULATION TRAIN STRUCTURAL IMPROVEMENTS

BID NUMBER B018-24

CONTRACT DOCUMENTS AND TECHNICAL SPECIFICATIONS

ISSUED FOR BID

DECEMBER 2023

Digitally signed by Sergio Luis Espinoza
Contact Info: Carollo Engineers, Inc.
Date: 2023.12.05 12:05:50-06'00'

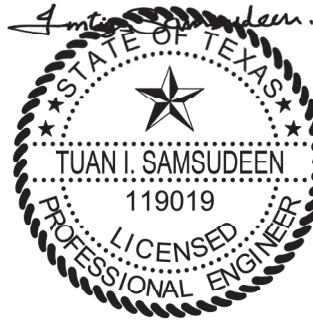


TBPELS No. F-882

BROWNSVILLE PUBLIC UTILITIES BOARD
BROWNSVILLE, TEXAS

WTP NO. 2 FLOCCULATION TRAIN STRUCTURAL IMPROVEMENTS

Digitally signed by Tuan I. Samsudeen
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Date: 2023.12.04 07:39:53-06'00'



STRUCTURAL



TBPELS No. F-882

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**LEGAL NOTICE
AND
INVITATION TO BID
BID # B018-24**

Sealed bids will be received by the PUBLIC UTILITIES BOARD of the City of Brownsville, Texas ("BPUB", "OWNER"), at the PUB Purchasing Department office; 1155 FM511, Olmito, TX 78575 **until 2:00 PM, local prevailing time, on January 9, 2024** for the Project described in the Contract Documents and Specifications entitled:

WATER TREATMENT PLANT #2 FLOCCULATION BASIN STRUCTURAL REPAIRS PROJECT

Bids received after this time will not be considered.

Bids will be publicly opened and read aloud on January 9, 2024 at 2:15 PM. Bidders can request a copy of the bid tabulation by emailing dsolitaire@brownsville-pub.com. Vendors can call in at 2:15 PM, January 9, 2024 to (956) 214-6020 to listen to the bid opening.

The Work in general includes, but is not limited to:

- 1) Structural repairs at Water Plant No.2 Rapid Mix Basin and Flocculation Basin as per Drawings and Contract Specifications. The southmost bridge at the Flocculation Basin is to be demolished and replaced in its entirety. There is shallow surface repair, deep surface repair, and crack injection repair that is required at the Rapid Mix Basin and Flocculation Basin. Many of these repairs are visible and have been identified on the drawings, however, some are not visible. The Contractor is required to pressure wash the entire interior walls and the base slab of the Rapid Mix Basin and the Flocculation Basin with a 5000PSI water blasting system. The quantities conducted for the repairs will be verified. The maximum number of days that the plant (Rapid Mix and Flocculation Basin) can be out of service is 7 Calendar Days continuously, after which, the plant will be placed online. The contractor is required to coordinate with plant staff before any electrical and plant shutdowns are performed. The repairs and formwork for the bridge replacement will have to be performed during the 7 Calendar Day timeframe. The Contractor is required to schedule the work and purchase necessary materials ahead of time to conduct the work within the contract timeframe.

Copies of the Contract Documents and Specifications may be obtained at the following website https://www.brownsville-pub.com/rfp_status/open/. A non-mandatory pre-bid conference shall be held at the BPUB Purchasing Department via conference call (956-214-6020) at 10:00 AM, local prevailing time, on December 19, 2023.

Each bid, in duplicate, shall be enclosed in a sealed envelope and shall be plainly marked on the outside of the envelope: **"BID B018-24 WATER TREATMENT PLANT #2 FLOCCULATION BASIN STRUCTURAL REPAIRS PROJECT, January 9, 2024 at 2:00**

PM". This envelope shall be addressed to Diane Solitaire; Brownsville Public Utilities Board; Purchasing Department; 1155 FM 511, Olmito, Texas 78575.

Each bid shall constitute an offer to the Board, as outlined therein, and shall be irrevocable for at least ninety (90) calendar days after the time announced for the opening thereof.

Each bid shall be accompanied by a Certified or Cashier's check payable to the order of the Brownsville Public Utilities Board, City of Brownsville, Texas for a sum not less than five (5%) percent of the total amount bid. In lieu of a check, a Bid Bond with a Corporate Surety licensed to do business in the State of Texas, may be submitted in an amount not less than five (5%) percent of the total amount bid conditioned that the BIDDER will pay the BPUB, as mutually agreed to liquidated damages, and not as a penalty, the amount specified in the Bond, unless he enters into a BPUB contract in accordance with his bid. BIDDER is required to execute a contract and furnish a Performance Bond, Payment Bond and a Certificate of Insurance. If the BIDDER fails to execute the contract and to furnish satisfactory Performance and Payment Bonds and Insurance Certificates within ten (10) calendar days from the date on which he is notified that his bid has been accepted, the amount of his check or bid bond shall be forfeited to the BPUB as mutually agreed to liquidated damages, and not as a penalty. **No bid will be considered if the Bid Security is not submitted.**

The BPUB will not be responsible in the event that the U.S. Postal Service or any other courier system fails to deliver the sealed bids to the Brownsville Public Utilities Board, Purchasing Office by the given deadline above. **No bids will be accepted via facsimile or electronic transmission.**

The BPUB specifically reserves the right to reject any or all bids, to waive irregularities or informalities in any or all bids and to accept any bid which is deemed to be in the best interest of the Board or to reject the bids. The award will be made to the responsive and responsible bidder submitting the lowest bid as determined by the BPUB.

Equal Opportunity in Employment - All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin. Bidders will be required to comply with the President's Executive Order No. 11246, as amended by Executive Order 11375, and as supplemented in Department of Labor regulations 41 CFR, Part 60. The requirements for bidders and contractors under this Order are explained in the Specifications.

Diane Solitaire

Purchasing Department
(956) 983-6366

INSTRUCTIONS TO BIDDERS
Please submit this page upon receipt

Acknowledgment Form

**WATER TREATMENT PLANT #2 FLOCCULATION BASIN STRUCTURAL
REPAIRS PROJECT**

BID #B018-24

For any clarifications, please contact Diane Solitaire at the Brownsville Public Utilities Board, Purchasing Department at (956) 983-6366 or e-mail: dsolitaire@brownsville-pub.com

Please e-mail this page upon receipt of the bid package or legal notice. If you only received the legal notice and you want the bid package mailed, please provide a method of shipment with account number in the space designated below.

Check one:

Yes, I will be able to send a bid; obtained bid package from website.

Yes, I will be able to send a bid; please email the bid package.

Email: _____

Yes, I will be able to send a bid; please mail the bid package using the carrier & account number listed below:

Carrier: _____

Account: _____

No, I will not be able to send a bid for the following reason:

If you are unable to send your bid, kindly indicate your reason for "No bid" above and return this form **via email to dsolitaire@brownsville-pub.com**. This will ensure you remain active on our vendor list.

Date _____

Company: _____

Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Phone: _____ Fax: _____

Email: _____

Special Instructions

Contract Information

- **Interpretation**

Questions concerning terms, conditions, and Technical Specifications should be directed to:

Diane Solitaire, Purchasing and Materials Manager
email: dsolitaire@brownsville-pub.com

Tentative Time Line

1. Bid Release Date: December 11, 2023
2. Virtual Pre-Bid Meeting December 19th at 10 AM
3. Bid Deadline: January 9, 2024 at 2:00 PM - **Vendor must submit bid, in duplicate, sealed in an envelope to:**

Diane Solitaire, Purchasing and Materials Manager
1155 FM 511
Olmito, TX 78575

Bid #B018-24 - WATER TREATMENT PLANT #2 FLOCCULATION BASIN STRUCTURAL REPAIRS PROJECT
Due January 9, 2024 at 2:00 PM

The above noted information must be included on bid envelope and on any carrier's envelope/package. The Brownsville Public Utilities Board will not be held responsible for missing, lost or late mail. Brownsville Public Utilities Board will not accept electronic transmissions or facsimiles of sealed bids.

4. December 19, 2023 – Non Mandatory Pre-Bid Conference at 10:00 AM, local prevailing time, via conference call (956-214-6020)
5. January 9, 2024 - Open bids at 2:15 PM
6. January 9, 2024 - January 14, 2024 - Evaluate bids
7. January 15, 2024 - Deadline to provide final recommendations for Board approval.
8. February 12, 2024 - Send to Utilities Board for formal and possible Contract award approval

- **“Or Equal”**

Brand name and/or manufacturer's references used in this Request are descriptive – not restrictive – they are intended to generally indicate type and quality desired. Brands of like nature and quality will generally be considered. If bidding on other than referenced Specifications, please provide complete descriptive information of said material/equipment article. BPUB also reserves the legal

right to specify a “sole source” component if such component is critical for integration to a larger BPUB assembly and alternative manufactured items will not meet the design and/or performance needs of the BPUB, in BPUB’s sole discretion.

- **Pricing**

Bid unit prices on BPUB estimated quantities specified, extend and show total. In case of errors in extension, unit prices expressed in written words and not numerals, shall govern. Prices shall remain firm throughout the Contract.

All fields (UNIT PRICE & TOTAL PRICE) in the Bid Schedule must be filled in. The data must be complete to identify any bidding brand called for specifically.

Failure to submit any of the above information with the sealed bid may disqualify bid as non-responsive.

- **Contractor Representative**

The successful contractor agrees to send a personal representative with binding authority for the company to the Brownsville Public Utilities Board, upon request, to make any minor clarifications or adjustments and/or assist with coordination of all transactions as needed to allow Contract entry.

- **Quality of Products**

All material and equipment items specified must be new, in first class condition, including containers suitable for shipment and storage. No substitutions in standard grades or lesser quality will be accepted.

- **Determining Factors for Award**

1. Price
2. Responsibility of contractor to perform the intended work and responsiveness to the bid request.
3. Compliance with requirements of the Technical Specifications
4. Quality of performance on previous work on similar contracts
5. Recent successful completion of similar projects
6. BPUB financial and legal responsibility evaluations of any identified teaming arrangements involving significant joint ventures, sub-contractors and suppliers
7. Safety record will be considered when determining the responsibility of the bidder

- **Contract with Vendor/Entity Indebted to BPUB**

It is a policy of the BPUB to refuse to enter into a contract or other transaction with an individual, sole proprietorship, joint venture, Limited Liability Company or other entity indebted to BPUB.

- **Vendor ACH (Direct Deposit) Services**

The BPUB has implemented a payment service for vendors/contractors by depositing the contract payment directly to the contractor's/vendor's bank account. Successful vendor(s)/contractors will be required to receive payments directly through Automated Clearing House (ACH) in lieu of a paper check. **The awarded vendor must agree to receive payments via ACH (Direct Deposit).**

- **Tax Identification Number (TIN)**

In accordance with IRS Publication 515, a W9 form, or a W8 form in cases of a foreign vendor, will be required of all vendors doing business with the Brownsville PUB. If a W9 or W8 form is not made available to Brownsville PUB, the first payment will be subject to income tax withholding at a rate of 28% or 30% depending on the U.S. status and the source of income as per IRS Publication 515. **The W9 or W8 form must be included with bid response.** Attached are sample forms.

- **Taxes**

The City of Brownsville and its Brownsville Public Utilities Board are exempt from Federal Excise Tax, State Tax and local sales Taxes. Do not include any taxes in the bid proposal. If it is later determined that tax was included in the bid it will not be included in the tabulation or any awards. Tax exemption certificates will be furnished by BPUB upon request.

- **Signing of Bid**

Failure to sign bid will disqualify it. Person signing bid should show title or legal authority to bind their firm to a Contract.

- **EEOC Guidelines**

During the performance of this Contract, the contractor agrees not to discriminate against any employee or applicant for employment because of race, national origin, age, religion, gender, sexual preference, marital or veteran status, or physically challenging condition.

- **Living Wage Statement**

On April 16, 2007, the BPUB Board of Directors approved a local "living wage" policy that requires all Contractors and Subcontractors performing 100% Non-Federally funded Work for the BPUB, to pay a minimum wage rate of \$8.00/hour. The BPUB requires that all Contractors and Subcontractors comply with this policy. Otherwise, the BPUB adopts the Federal Department of Labor Wage scales for Cameron County on 100% Non-Federally funded projects as specified later herein in the Supplementary Conditions.

- **Contract and Purchase Order**

The services shall be completed in a timely manner as specified in Specifications. A Contract for the services will be placed into effect by means of a purchase order and/or Construction Agreement issued by the Brownsville Public Utilities Board after tabulation and final Contract approval by the Board.

- **Brownsville Public Utilities Board Rights**

1. If only one or no bid is received by "submission date", the BPUB has the right to reject, re-bid, accept and/or extend the bid by up to an additional two (2) weeks from original submission date.
2. The right to reject any/or all bids and to make award as it may appear to be advantageous to the Brownsville Public Utilities Board.
3. The right to hold bid for 90 calendar days from submission date without action, and to waive all informalities in any bid.
4. The right to extend the total bid beyond the original 90-calendar day period prior to an award, if agreed upon in writing by all parties (BPUB and vendor/contractor) and if bidder/vendor holds original bid prices firm.
5. The right to terminate for cause or convenience all or any part of the unfinished portion of the Project resulting from this solicitation within seven (7) calendar days written notice; for cause: upon default by the vendor/contractor, for delay or non-performance by the vendor/contractor; or if it is deemed in the best interest of the BPUB for BPUB's convenience. (See, General Conditions Article 15)

- **Corrections**

Any interpretation, correction, or change of the Invitation to Bid will be made by written ADDENDUM. Changes or corrections will be issued by the Brownsville PUB Purchasing Department. **Addenda will be emailed to all who have returned the Bid Acknowledgment form.** Addenda will be issued as expeditiously as possible. It is the responsibility of the vendors/contractors to determine whether all Addenda have been received. It will be the responsibility of all respondents to contact the Brownsville PUB prior to submitting a response to the Invitation to Bid to ascertain if any/all Addenda have been issued, and to obtain any all Addenda, execute them, and return Addenda with the response to the Invitation to Bid. Addenda may also be posted on BPUB's website.

1. RECEIPT AND OPENING OF BIDS:

The Brownsville Public Utilities Board, City of Brownsville, Texas (hereinafter called OWNER), invites bids on the form attached hereto, all blanks of which must be appropriately filled in, in ink, for Project entitled **"Bid B018-24, WATER TREATMENT PLANT #2 FLOCCULATION BASIN STRUCTURAL REPAIRS PROJECT"**.

The OWNER may consider informal and non-responsive, any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids.

Any bid may be withdrawn by vendor/contractor prior to the above scheduled time for the opening of bids or OWNER authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No BIDDER may withdraw a bid within at least ninety (90) calendar days after the actual date of the opening thereof.

2. INSPECTION OF SITE:

Each BIDDER shall visit the Project site of the proposed Work and fully acquaint himself with the existing conditions there relating to construction and labor, and shall fully inform himself as to the facility involved, the difficulties and restrictions attending the performance of the Contract. The BIDDER shall thoroughly examine and familiarize himself with the Drawings, Technical Specifications, and all other Contract Documents. The Contractor, by the execution of the Contract, shall in no way be relieved of any obligation under it due to his failure to receive or examine any form or legal instrument, or to visit the Project site and acquaint himself with the conditions there existing and the OWNER will be justified in rejecting any claim for extra time, or compensation, or both, based on facts regarding which Contractor should have been on notice as a result of such a diligent Project site visitation. Visits to the Project site shall be arranged by calling <Robert Rojas, Water Treatment Plant No.2 Chief Operator, at telephone no. 956-983-6685.

3. PREPARATION OF BID AND USE OF SEPARATE BID FORMS:

These Contract Documents include a complete set of bidding documents. The BIDDER shall copy all Documents listed in the table of contents under the heading BIDDING DOCUMENTS and shall submit two sets (original signed and one signed photocopy) of his bid on these forms. A bid shall be comprised of the BIDDING DOCUMENTS completed by the BIDDER plus supplemental information required by the Specifications and Contract Documents.

If any of the information submitted as part of the bid is considered to be proprietary by the BIDDER, he shall conspicuously identify such intended confidential information in his bid. BPUB is subject to the provisions of the Texas Public Information Act and cannot legally guarantee confidentiality of submittals and may need to consult with its legal counsel and the Texas Attorney General in rendering decisions on any requested disclosures.

- a) Preparation. Each bid shall be carefully prepared using the bid and bid data forms included as a part of the bidding documents. Entries on the bid and bid data forms shall be typed, using dark black ink, or legibly written in black ink. All prices shall be stated in written words and numeric figures, except where the forms provide for figures only. In case of discrepancy, especially in any sum total extensions, the amount shown in written words will generally prevail over numeric unit prices.

The BIDDER shall acknowledge, in the space provided in the bid form, receipt of each Addendum issued for the Specifications and Documents during the bidding period.

The BIDDER shall assemble all drawings, catalog data, and other supplementary information necessary to thoroughly describe Work, materials and equipment covered by the bid, and shall attach such supplemental information to the copies of the Specifications and documents submitted.

- b) Signatures. Each BIDDER shall sign the bid with his usual signature and shall give his full business title and address. The BIDDER's corporate name stated on the bid shall be the exact legal name of the firm. The names of all persons signing should also be typed or printed below the signature.

Bids by partnerships shall be signed with the partnership name followed by the signature and designation title/officer of one of the partners or other authorized representative. A complete list of the partners shall be included with the bid.

Bids by a corporation shall be signed in the official corporate name of the corporation, followed by the signature and designation of the "president," "secretary," or other legally appropriate person authorized to bind the corporation.

A bid by a person who affixes to his signature the word "president," "secretary," "agent," or other designation, without disclosing his principal corporation, will be rejected. Satisfactory evidence of the legal authority of the officer signing on behalf of the corporation shall be furnished. Bidding corporations shall designate the state in which they are incorporated and the address of their principal office.

- c) Submittal. The original signed bid (and its accompanying photocopy) shall be transmitted to arrive at the designated BPUB address not later than the date and time stipulated in the Legal Notice and Invitation to Bid.

Submit the original signed bid (and its accompanying photocopy) to:

Brownsville Public Utilities Board
1155 FM 511
Olmito, Texas 78575
Attention: Ms. Diane Solitaire
Purchasing Department

Each bid must be submitted in duplicate as stated above (original signature and photocopy), in a sealed envelope bearing on the outside the name of the BIDDER, his address, and the name of the Project for which the bid is submitted. If forwarded by mail, the sealed envelope containing the bid itself must be enclosed in another mailing envelope addressed as specified in the bid form.

4. METHOD OF BIDDING: UNIT PRICE AND LUMP SUM.

Prices shall be firm, not subject to qualification, condition or adjustment. Prices shall be in United States dollars. Prices shall be lump sum, except where unit prices are requested by the bid forms. When unit price items are required by the bid, the unit prices for each of the several items in the

bid of each BIDDER shall include its pro-rata share of overhead, so that the sum of the products obtained by multiplying the quantity shown for each item, by the unit price bid, represents the total bid. Any bid not conforming to that requirement may be rejected as informal and non-responsive. The special attention of all BIDDERS is called to this provision, (See: General Conditions paragraph 11.9) for should conditions make it necessary to revise any unit price quantities, generally, a fifteen (15%) percent plus or minus tolerance quantity limit will be fixed for such increased or decreased quantities for which no extra compensation will be allowed, provided the net monetary value of all such additive and subtractive changes in quantities of such items of work pursuant to public competitive bidding statutes (i.e., difference in cost) shall not cumulatively increase or decrease the original Contract Price by more than twenty-five (25%) percent. A proposed decrease only, that exceeds twenty-five (25%) percent of the original Contract Price must be agreed to in writing in advance by the Contractor.

5. DISCLOSURE BY BIDDER:

Each BIDDER shall submit with the bid documents, on the form furnished for that purpose, his Pre-Bid Disclosure Statement showing his experience record in performing the type of work embraced in the contract, his organization and equipment available for the work contemplated, and, when specifically requested by the OWNER, a detailed financial statement. The OWNER shall have the right to take such steps as it deems necessary, including telephonic contact to other owner references, to determine the ability and responsibility of the BIDDER to perform his obligations under the Contract and the BIDDER shall be responsive in furnishing the OWNER all such information and data for this purpose as it may request. OWNER reserves the right to reject any bid where an investigation of the available evidence or information does not satisfy the OWNER that the BIDDER is responsible to properly carry out the terms of the Contract. This shall also apply to any proposed subcontractor(s).

6. SUBCONTRACTS:

The BIDDER is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this Contract must be acceptable to the OWNER, and that a Pre-Bid Disclosure Statement for each proposed subcontractor must also be submitted with the bid documents.

7. BID SECURITY:

Each bid must be accompanied by a certified or cashier's check, or a bid bond prepared on the form of the bid bond attached hereto, duly executed by the BIDDER as principal, and having as surety therein a surety company approved by the OWNER, and authorized to do business in the State of Texas, in the amount of not less than five (5%) percent of the total bid amount, but not less than \$2,500.00. Such checks, or bid bonds will be returned to all except the three lowest BIDDERS within fifteen (15) calendar days after the opening of bids, and the remaining checks, or bid bonds will be returned promptly after the OWNER and the accepted successful BIDDER have executed the Contract or if no award has been made, within Ninety (90) calendar days after the date of the opening of bids. The bid security will be returned upon demand of the BIDDER at any time thereafter, so long as he has not been notified of the acceptance of his bid.

8. ADDENDA AND INTERPRETATIONS:

No oral interpretations by OWNER and its representatives shall be binding upon OWNER as to the meaning of the Plans, Specifications, Contract Documents, or other pre-bid documents.

Every request for such interpretation should be made in writing, addressed to Diane Solitaire, BPUB Purchasing Department. Any interpretation, correction, or change to the Invitation to Bid will be made by ADDENDUM. Changes or corrections will be issued by the Brownsville PUB Purchasing Department only and will be on file at the BPUB Department mentioned above. Addenda will be emailed to all who have returned the acknowledgement form. Addenda will be issued as expeditiously as possible. It is the BIDDER's responsibility to inquire as to any Addenda issued and failure of any BIDDER to receive any such Addenda or interpretation shall not relieve such BIDDER from any obligation under his bid as submitted. All Addenda so issued shall become part of the Contract Documents. Addenda may also be posted on BPUB's webpage.

Exceptions or conditional qualifications by the BIDDER to the Plans, Technical Specifications, Contract Documents, or other pre-bid documents will not be permitted at the time of submitting the Bid Documents to the OWNER, and any exceptions or conditional qualifications taken by BIDDER, will automatically deem the bid conditional and non-responsive and subject to OWNER rejection.

9. FACSIMILE MODIFICATION:

Any BIDDER may modify (not originally submit) his bid by facsimile communication at any time prior to the scheduled bid closing time for receipt of bids, provided such communication is received by the OWNER, in the BPUB Purchasing Department, prior to the bid closing time, and provided further, the OWNER is satisfied that a written confirmation of the facsimile modification, over the original signature of the BIDDER, was also mailed prior to the bid closing time. The facsimile communication should not reveal the total bid price, but only should provide the clarification, addition or subtraction, or other modification, so that the final bid prices or terms intended will not be known by the OWNER, until the original sealed bid is opened and the Bidder's intended modification computed by OWNER.

Revised bids submitted before the opening of bids, whether forwarded by mail or facsimile, if representing an increase in excess of two percent (2%) of the original bid submittal, must have the bid security (bid bond or check) adjusted accordingly; otherwise the bid will not be considered responsive.

If the written and originally signed confirmation of a bid revision is not received within three (3) calendar days after the bid closing time, no consideration will be given to any proposed adjustment contained in the facsimile modification.

10. TIME FOR RECEIVING BIDS:

Bids received prior to the advertised hour of opening will be securely kept sealed by BPUB. The officer whose duty it is to open them will decide when the specified time has arrived, and no bid received thereafter will be considered; except that when a bid arrives by mail after the time fixed for opening, but before the public reading of all other bids is completed, and it is shown to the satisfaction of the OWNER that the non-arrival on time was due solely to delay in the mails for which the BIDDER was not responsible, such bid will be received and considered.

BIDDERS are cautioned that, while facsimile modifications of bids may be received as provided above, such modifications, if not explicit and if in any sense subject to misinterpretation, shall make the bid so modified or amended, subject to rejection for non-responsiveness.

11. OPENING OF BIDS:

At the time and place fixed for the public opening of bids, the OWNER will cause to be opened and publicly read aloud every bid received within the time set for receiving bids, irrespective of any irregularities therein. BIDDERS and other persons properly interested in a bid (subcontractors, suppliers, etc.) may be present, in person or by representative, but shall carry identification and present same to BPUB as requested.

12. WITHDRAWAL OF BIDS:

Bids may be withdrawn on written, facsimile or electronic transmission request dispatched by the BIDDER in time for delivery in the normal course of business prior to the time fixed for bid opening; provided, that written confirmation of any facsimile withdrawal over the signature of the BIDDER is placed in the mail and postmarked prior to the time set for bid opening. The bid security of any BIDDER withdrawing the bid in accordance with the foregoing conditions will be returned promptly.

13. AWARD OF CONTRACT: REJECTION OF BIDS:

The Contract will be awarded to the responsive and responsible BIDDER submitting the lowest bid complying with the conditions of the Legal Notice and Invitation for Bids. The BIDDER to whom the award is made will be notified at the earliest possible date. The OWNER, however, reserves the right to reject any and all bids and to waive any informality in bids received, whenever such rejection or waiver is in BPUB's interest.

The OWNER reserves the right to consider as not responsible, any BIDDER who does not habitually perform with his own forces the major portions of the Work involved in construction of the improvements embraced in this proposed Contract. This provision is meant to prevent wholesale assignment and "brokering" of awarded contracts.

14. EXECUTION OF AGREEMENT: PERFORMANCE AND PAYMENT BOND:

Subsequent to the Notice of Award and within ten (10) calendar days after the prescribed forms are presented for signature, the successful BIDDER shall execute and deliver to the OWNER an

Agreement in the form included in the Contract Documents in such number of copies as the OWNER may require.

Having satisfied all conditions of award as set forth elsewhere in these Documents, the successful BIDDER shall, within the period specified in the preceding paragraph, furnish a Performance Bond and Payment Bond, in accordance with the following parameters:

- a.) For a Contract in excess of \$100,000.00, a Performance Bond shall be executed in the full amount of the Contract, conditioned upon the faithful and timely performance of the Work in accordance with the Plans, Specifications, and Contract Documents. Said Bond shall be solely for the protection of the OWNER.
- b.) For a Contract in excess of \$50,000.00, a Payment Bond shall be executed in the full amount of the Contract, solely for the protection of all proper claimants supplying labor and material in the prosecution of the Work provided for in the Contract, for the use of each such claimant perfecting a proper and timely claim. Payment Bonds are required under Texas law, since no mechanics' liens are allowed against BPUB's public property assets.

When bonds are required, they shall serve as security for the faithful performance of the Contract, and for the payment of all persons, firms or corporations to whom the Contractor may become legally indebted to for labor, materials, tools, equipment, or services of any nature, including utility and transportation services employed or used by him in performing the Work. Such bonds shall be in the same form as that included in the Contract Documents and shall bear the same date as, or a date subsequent to that of the Agreement. The current power of attorney for the person who signs for any surety company shall be attached to such bonds. These bonds shall be signed by a guaranty or surety company legally authorized to do business in the State of Texas and appearing on the most recently issued (as of the date of bid opening) federally qualified U. S. Treasury Circular 570 List of Approved Sureties.

The failure of the successful BIDDER to execute such Agreement and to supply the required bonds and insurance certificates within ten (10) calendar days after the prescribed forms are presented for signature, or within such extended period as the OWNER may grant in writing, based upon reasons determined sufficient by the OWNER, shall constitute a default, and the OWNER may either award the Contract to the next lowest responsive and responsible BIDDER, or re-advertise for bids, and may charge against the defaulting BIDDER the difference between the amount of the defaulted bid and the amount for which a final Contract for the Work is subsequently executed, irrespective of whether the amount thus due exceeds the amount of the bid bond. If a more favorable bid is received by re-advertising, the defaulting BIDDER shall have no claim against the OWNER for a bid bond refund.

15. LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT:

The successful BIDDER, upon his failure or refusal to execute and deliver the Contract, Bonds and insurance certificates required within ten (10) calendar days after he has received BPUB notice of the acceptance of his bid, shall forfeit to the OWNER, as mutually agreed to liquidated damages

(and not as a penalty) for such failure or refusal, the security provided in the bid bond or otherwise deposited with his bid.

16. TIME OF COMPLETION AND LIQUIDATED DAMAGES:

BIDDER agrees by submission of his bid that PERFORMANCE TIME IS OF THE ESSENCE OF THIS CONTRACT and further agrees to commence Work on the date to be specified in a BPUB written "Notice to Proceed" issued by the OWNER and to Substantially Complete the Project as provided in Article 3 of the Construction Agreement.

BIDDER agrees by submission of his bid to pay as mutually agreed to liquidated damages, and not as a penalty, the sum as provided in said Construction Agreement, Article 3.

17. NOTICE OF SPECIAL CONDITIONS:

Attention is particularly called to those parts of the Contract Documents and Specifications which address the following:

- A. Access to Work - Inspection and testing of materials.
- B. Insurance requirements.
- C. Indemnification by Contractor
- D. Wage and Hour Provisions.
- E. State Sales and Use Tax Exemption Provisions.
- F. Subsurface Geologic Conditions.
- G. Certification Regarding Debarment, Suspension and other Responsibility Requirements (EPA 5700-49).

18. LAWS AND REGULATIONS:

The BIDDER's attention is directed to the fact that all applicable federal, State and local laws, statutes, ordinances, codes and the rules and regulations of all authorities having jurisdiction over construction of the Project, as may be periodically amended, shall apply to the Contract throughout, and they will be mutually deemed to be included in the Contract, the same as though herein written out in full.

19. EQUAL EMPLOYMENT OPPORTUNITY:

Attention of BIDDERS is particularly called to the requirement for ensuring that employees and applicants for employment are not discriminated against because of their race, religion, gender, age, sexual preference, physically challenging condition or national origin.

Equal Opportunity in Employment - All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin. Bidders will be required to comply with the President's Executive Order No. 11246, as amended by Executive Order 11375, and as supplemented in Department of Labor regulations 41 CFR, Part 60. The requirements for bidders and contractors under this order are explained in the General Conditions.

20. PRE-BID CONFERENCE:

A pre-bid virtual or in-person meeting between the OWNER, prospective bidders, suppliers, etc., will be held to answer any questions concerning the Work. No Addenda will be issued at this meeting. Subsequent thereto, if necessary to clear up any written questions, a written Addendum will be issued by the OWNER to all pre-bid conference attendees. The pre-bid meeting will be held at the place, time and date indicated in the Legal Notice. Attendance at the Pre-Bid Conference is NOT mandatory for prospective bidders.

21. SUBMITTAL OF TRENCH SAFETY DESIGN: (RESERVED)

For Work involving excavations generally deeper than five (5) feet within narrow trenches, the apparent low BIDDER shall provide the OWNER with a Trench Safety System Plan and a certificate signed and sealed by a Registered Professional Engineer licensed by the State of Texas, within twenty-one (21) calendar days after the date of the opening of Bids prior to award of the Contract. Failure to timely comply may disqualify BIDDER. This Section may be "Reserved" by BPUB if not applicable to the Work.

22. INFORMATION TO BE SUBMITTED WITH BID:

Each BIDDER shall submit with his bid, the following:

a) Equipment and Materials. In addition to the information submitted on the bid and bid data forms, each BIDDER shall submit all specifications, preliminary drawings, and similar descriptive information necessary to describe completely the equipment and materials he proposes to furnish.

The bid shall be based on using new equipment and materials, which comply with the Specifications and Contract Documents in every respect, unless existing equipment is specifically noted by OWNER for reuse. If alternate or "equal" equipment and materials are indicated in the bid, it shall be understood that the OWNER will have the option of selecting any one of the alternates so indicated and such selection shall not be a cause for extra contractor compensation or extension of time. OWNER specifically reserves the legal right to specify "sole source" equipment or materials in the Specifications when unique circumstances warrant.

b) Contractor's Field Organization and Safety Record.

- (i) An organization chart showing the names of field management, supervisory, technical personnel, and number of employees/workforce available and the details of the management, supervisory, and technical organization which he proposes to use for this Project. The successful BIDDER's organizational concept will be subject to the review and acceptance of the OWNER.
- (ii) The experience record of the Contractor's field superintendent(s) shall be submitted with the bid.
- (iii) The Contractor's job-safety record summary for the previous five (5) years
- (iv) The two most recent year's independently audited Financial Statements

- (v) List of three (3) projects completed by CONTRACTOR of both similar size and scope over the past five (5) years

23. PREFERENCE LAW:

Bid evaluations will take into consideration any Preference Laws of the State of Texas, and any reciprocity laws of other states as they may be addressed by current Texas law.

24. SUBSURFACE GEOLOGIC CONDITIONS: (RESERVED)

Each BIDDER shall be responsible for determining prior to bidding, the types of subsurface materials which will be found. If test borings have been made on the Project site by the BPUB or its consultants, the locations and logs of the test borings are bound as an appendix to these Specifications and Documents.

It is to be expressly understood and acknowledged by the BIDDER, that any information on subsurface geology made available by OWNER for BIDDER'S convenience shall **not be a part of the Contract Documents and there is no expressed or implied guarantee of the data given, nor of the interpretation thereof.**

All excavation for this Project will be unclassified and the BIDDER shall be responsible for investigating and satisfying himself of subsurface geologic conditions (including the presence or likelihood of encountering soils requiring dewatering, rock or rock-like materials) prior to submitting his bid, which shall include any and all costs BIDDER associates with avoiding, managing or removing said subsurface geologic conditions without claim for extra compensation against OWNER.

Should BIDDER desire to perform on-site investigations prior to submitting his bid, he is required to notify the OWNER of such intentions and obtain OWNER's written permission not less than 48 hours prior to performing the investigation. BIDDER is responsible for obtaining all related insurance and necessary permits from all sources.

25. DISPOSAL OF EXCESS MATERIALS:

After completion of this Project there may be in some instances an excess of spoil material or waste material left over. In such cases where there is an excess of material, BIDDER shall load and haul it away from the job site and dispose of it in a legal manner so as not to: trespass; adversely impact any protected wetlands; adversely impact the 100 year flood plain; adversely impact any endangered species; or otherwise create drainage diversions or impoundments. No extra remuneration for this Work will be allowed.

26. EROSION AND SEDIMENT CONTROL MEASURES:

The BIDDER is expected to conduct his Work in such a manner as to minimize any soil erosion or sediment runoff from the construction site. Earth cuts and fills shall have smooth, flat side slopes, as generally indicated on the PLANS, to preclude erosion of the soil. Such operations

should be timed consistent with the actual need for doing the Work and only to leave raw, unprotected surfaces for a minimum of time.

Existing lawns are to remain intact as far as practical. Such areas as are disturbed shall be duly restored by the BIDDER to as good as or better than original condition using the same type of grass, shrubs, or cover as the original. The BIDDER shall be responsible for correcting any erosion that occurs at his sole cost without claim for extra compensation.

As construction progresses, and in accordance with State and federal laws regulating stormwater runoff and management from construction sites greater than five acres in size, if applicable, (See: Section 405 of the Water Quality Act of 1987, Section 402(P) as amended), and at locations where erosion with sediment runoff occurs or is likely to occur, the BIDDER shall construct temporary ditches, perimeter siltation screens, retainage levees, drains, inlets, or other works to manage, prevent, or correct the possible conditions. Upon completion of the Work, such facilities shall be removed by contractor.

During construction, the BIDDER shall take the necessary precautions to see that erosion is controlled and sediment runoff is prevented so as to protect the quality of any neighboring water bodies.

27. SAFETY PROVISIONS:

BIDDER shall provide barricades, flares, warning signs, and/or flagmen so that danger and inconvenience to the OWNER, public, and any job site working personnel, will be mitigated. In addition to any other requirements of the Contract Documents, the BIDDER shall be responsible for familiarity and compliance with all Federal (OSHA), State, railroad and local safety rules, laws and requirements.

28. PROTECTION OF PROPERTY AND EXISTING UTILITIES:

Within developed areas, all public and private property along and adjacent to the BIDDER'S operations, including roads, driveways, lawns, yards, shrubs, drainage gradients, and trees, shall be adequately protected, and when damages occur, they shall be repaired, replaced, or renewed or otherwise put in a condition equal to, or better than, that which existed before the BIDDER caused the damage or removal.

An attempt has been made by BPUB and the ENGINEER to locate and show all known existing utilities on the PLANS, but the possibility remains strong that some underground utilities may exist that have not been shown. The BIDDER, through mandatory contact with local utility owners, shall keep himself informed and take such precautions as necessary to avoid utility damage and unsafe working conditions for employees.

29. WAGES AND HOURS:

The most recent wage rate determination from the U.S. Department of Labor for Cameron County, Texas as amended within the previous three (3) years and as locally adopted by the BPUB, is a

part of the Supplementary Conditions and controls minimum wage, hour and any fringe benefits, with the exception that no wage shall be paid below \$8.00 as established locally by the BPUB.

A copy of the appropriate (building and/or heavy/highway) wage rate schedule(s) must be posted at the job site in both English and Spanish and kept posted in a conspicuous place on the site of the Project at all times during construction. The BIDDER shall familiarize himself with the included General and Supplementary Conditions Section entitled "Wage and Labor Standard Provisions - 100% Non-Federally Funded Construction." Copies of the current pre-bid wage rate schedule(s) are included in the Contract Documents, but the responsibility for initial posting and keeping same posted, rests upon the BIDDER.

30. WARRANTY/GUARANTEE:

The BIDDER shall warranty and guarantee the Work, equipment and materials for a period of at least one (1) year after date of final acceptance in writing by the OWNER. During this period, the BIDDER shall make any repairs and/or replacements of defective equipment and materials and corrections of Work due to poor workmanship or manufacturing, all as may be required for full compliance with the General Conditions, Plans and Specifications. This combined workmanship quality guarantee, and minimal equipment and materials warranty, shall apply to all matters reported by the OWNER in writing within said one (1) year period and this post-construction guarantee/warranty period shall be included in the coverage period set forth in the Performance Bond.

31. STATE SALES AND USE TAX EXEMPTION:

Pursuant to 34 Texas Administrative Code 3.291, in order for the Brownsville PUB to continue to benefit from its status as a State Sales and Use Tax Exempt Organization. Construction contracts must be awarded on a "separated contract" basis. A "separated contract" is one that distinguishes the value of the tangible personal property (materials such as pipe, bricks, lumber, concrete, paint, etc.) to be physically incorporated into the Project realty, from the total Contract Price. Under the "separated contract" format, the Contractor in effect becomes a "seller" to the Brownsville PUB of materials that are to be physically incorporated into the Project realty. As a "seller", the Contractor will issue a "Texas Certificate of Resale" to the supplier in lieu of paying the sales tax on materials at the time of purchase. The Contractor will also issue a "Certificate of Exemption" to the supplier demonstrating that the personal property is being purchased for resale and that the resale is to the Brownsville PUB, which is a sales tax exempt entity under UTCA Tax Code Section 151.309(5). Contractors should be careful to consult the most recent guidelines of the State Comptroller of Public Accounts regarding the sales tax status of supplies and equipment that are used and/or consumed during Project Work (gas, oil, rental equipment), but that are not physically incorporated into the Project realty. Such items are generally not tax exempt. Contractors that have questions about the implementation of this statute are asked to inquire directly with the State Comptroller of Public Accounts, Tax Administration Division, State of Texas, Austin, Texas 78774. Bidders will not include any federal taxes in bid prices since the City of Brownsville and Brownsville PUB are exempt from payment of such federal taxes. "Texas Certificates of Exemption", "Texas Certificates of Resale" and "Texas Sales Tax Permits" are forms available to the Contractor through the regional offices of the State Comptroller of Public Accounts.

BID
BB018-24

BPUB Purchasing Department
1155 FM 511
Olmito, Texas 78575
Due: January 9, 2024 at 2:00 PM

Bid of _____ hereinafter called BIDDER, a corporation organized and existing under the laws of the State of _____, or, a partnership, or an individual doing business as _____.

To the Brownsville Public Utilities Board of the City of Brownsville, Texas, hereinafter called OWNER.

Gentlemen:

The undersigned BIDDER, in compliance with your Invitation to Bid for the **WATER TREATMENT PLANT #2 FLOCCULATION BASIN STRUCTURAL REPAIRS PROJECT**, having read and examined the Plans and Specifications with related Contract Documents and visited the site of the proposed Work, and being familiar with all of the federal, state and local conditions surrounding the construction of the proposed Project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, equipment and supplies, and to construct the Project in accordance with the Contract Documents, within the time set forth herein, and at the Total Base Bid Amount prior to OWNER options on additive/deductive alternates of: (in words and numeric figures)

_____. These price(s) are to cover all expenses incurred in performing the Work required under the Contract Documents, of which this bid is a part. These price(s) are firm and shall not be subject to adjustment, provided this Bid is accepted by OWNER within ninety (90) calendar days after the time set for BPUB receipt of bids.

BIDDER hereby agrees to commence Work under this Contract on or before a date to be specified in a written "Notice to Proceed" to be issued by the OWNER, and to then fully complete the Project within the times established in Article 3 of the Construction Agreement. BIDDER further agrees to pay as liquidated damages, not as a penalty, for failure to do so, the sum(s) established in Article 3 of the Construction Agreement.

BIDDER agrees to perform all Work for which he contracts as described in the Technical Specifications and as shown on the Plans, for the prices indicated on the following Bid Form.

**BID SCHEDULE
BASE BID - B018-24
BROWNSVILLE PUBLIC UTILITIES BOARD**

The Bidder, in compliance with the Invitation for Bids for the **WATER TREATMENT PLANT #2 FLOCCULATION BASIN STRUCTURAL REPAIRS PROJECT**, having examined the scope of work and written Specifications, hereby proposes to furnish construction services for the following Unit prices and lump sums.

ITEM NO.	DESCRIPTION	EST QTY.	UNIT	UNIT PRICE (Written unit price in dollars)	UNIT PRICE	TOTAL PRICE
1	General Conditions as Specified in Contract Documents, Including Insurances, Necessary Temporary Equipment, Management, Mobilization, Demobilization, etc.	1	LUMP SUM			
2	Allowance for Unforeseen Conditions, such as replacement of electrical conduits, wiring, handrails, or any other miscellaneous items	1	LUMP SUM	Five Thousand Dollars	\$5,000	\$5,000
3	Pressure Wash interior walls and base slab of the Rapid Mix Basin and the Flocculation Basin with a 5000 PSI water blasting system	1	LUMP SUM			
4	Demolish and Replace the southmost concrete walkway bridge as shown on the drawings and contract specifications	1	LUMP SUM			
5	Shallow Surface Repair	100	SQ.FT			
6	Deep Surface Repair	100	SQ.FT			
7	Epoxy Crack Injection	200	LF			

TOTAL AMOUNT OF BID (ITEMS #1- #7): \$ _____

(written in words)

NOTE: Quantities are estimated. The Brownsville PUB reserves the right to increase or decrease quantities as allowed by Texas law (plus or minus fifteen (15%) percent and as deemed necessary by OWNER, without impacting the quoted unit prices. Prospective bidders are encouraged to visit and assess the existing Project site and structures prior to submitting a bid.

BIDDER Acknowledges receipt of the following Addenda:

SUBCONTRACTORS. The undersigned BIDDER proposes that he will be responsible to perform major portions of the Work at the Project site with his own forces and that specific portions of the Work not performed by the undersigned will be subcontracted and performed by the following subcontractors.

Work Subcontracted	Name of Subcontractor
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Bid amounts are to be legibly shown in both words and figures. In case of discrepancy, the unit price amount written in words will govern.

The above lump sum and unit prices shall include all labor, materials, excavation, bailing, shallow groundwater dewatering, shoring, removal, backfill, overhead, profit, insurance, etc., to cover the finished Work of the several kinds called for.

BIDDER understands that the OWNER reserves the right to reject any or all bids and to waive any informalities in the bidding and to elect to opt for any additive or deductive alternates in arriving at a final Contract price.

BIDDER agrees that this bid shall be good and may not be withdrawn for a period of ninety (90) calendar days after the scheduled bid opening.

The undersigned hereby declares that only the persons or firms interested in the bid as principal or principals are named herein, and that no other persons or firms than are herein mentioned have any interest in this Bid or in the Contract to be entered into; that this Bid is made without connection with any other person, company, or entities likewise submitting a bid or bid; and that it is in all respects for and in good faith, without collusion or fraud.

Upon receipt of written notice of the acceptance of this bid, BIDDER will execute the formal Contract attached within ten (10) calendar days and deliver the Bonds and Insurance Certificates as required under the GENERAL CONDITIONS. The Bid security attached in the sum of _____ (\$_____) is to become the property of the OWNER in the event the Contract, Bonds, and insurance certificates are not executed or delivered within the time above set forth, as mutually agreed to liquidated damages and not as a penalty for the delay and additional administrative expense to the OWNER caused thereby; otherwise the Bid security will be returned upon the signing of the Contract and delivering the approved Bonds and Insurance Certificates.

Seal affixed here if BID is by a Corporation:
Respectfully submitted,

By: _____
Signature (**Failure to sign disqualifies bid**)

Title

Address

Attest: _____

Signed, this _____ day of _____, 20__.

Principal

Surety

By: _____

IMPORTANT - Surety companies executing BONDS must be legally authorized by the State Board of Insurance to transact business in the State of Texas, and be currently listed as approved federal sureties in the most recently issued (as of the date of bid opening) edition of the U. S. Treasury Circular 570.

**CONTRACTOR'S
PRE-BID DISCLOSURE STATEMENT**

All questions must be answered or your bid may be deemed non-responsive and subject to rejection. The data given must be clear and comprehensive. **This statement must be notarized.** If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional relevant information he desires.

1. This Pre-Bid Disclosure Statement is submitted to the Brownsville Public Utilities Board by:

_____ a Corporation, ___ a Partnership, ___ a Texas Joint Venture, or ___ an Individual.
 Address: _____ Contractor's Telephone #: _____
 City _____ State _____ Zip Code _____

2. Years in business under present business name: _____

3. Years of experience in construction work of the type called for in this Contract as: A General Contractor _____, A Subcontractor _____.

4. What projects has your organization completed? List most recent FIRST.

Contract	Type of Work	Date Completed	Owners Name and Address	Amount

5. What projects does your organization have under way as of this date?

Contract	Type of Work	Date Completed	Owners Name and Address	Amount

6. Have you ever failed to complete any work awarded to you?
___ Yes ___ No. If "Yes", state where and why. _____

7. Are you at present in any binding arbitrations and/or lawsuits involving construction work of any type?
___ Yes ___ No. If "Yes", explain: _____

8. Explain in detail the manner in which you have inspected the work and jobsite proposed in this contract: _____

9. Explain in detail your plan or layout for performing the work proposed in this contract:

10. If this contract is awarded to you, your company's office administrative manager for the work will be Mr. (Ms.) _____, and your resident construction superintendent will be Mr. (Ms.) _____.

11. What experience in this type of work does the individual designated as resident superintendent above have? _____

12. What portions of the work do you intend to subcontract? _____

13. What equipment do you own or lease that is available for the proposed work?

Quantity	Description, Size Capacity, Etc.	Condition	Years in Service	Present Location

14. Have you received firm offers from all suppliers or manufacturers for all major items of material and/or equipment within the Base Bid Amount used in preparing your bid? Yes No

15. Attach resumes for the principal members of your organization, including the officers as well as the proposed superintendent for the project.

Credit available: \$ _____ Bank Reference: _____

Bonding Capacity available: \$ _____

The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by either the Owner's Engineer or Owner in verification of the recitals comprising this Pre-Bid Disclosure Statement.

The signatory of this questionnaire guarantees the truth and accuracy of all statements herein made and all answers herein expressed.

Dated this ____ day of _____, 20__.

By: _____

Title: _____

STATE OF _____

COUNTY OF _____

Subscribed and sworn to before me this ____ day of _____, 20__.

Notary Public

My commission expires: _____

**SUBCONTRACTOR'S
PRE-BID DISCLOSURE STATEMENT**

All Subcontractor questions must be answered or the General Contractor's Bid may be deemed non-responsive and subject to rejection. The data given must be clear and comprehensive. **This statement must be notarized**. If necessary, questions may be answered on separate attached sheets. The prospective Subcontractor may submit any additional relevant information he desires.

1. This Pre-Bid Disclosure Statement is submitted to the Brownsville Public Utilities Board by: _____

__ a Corporation, __ a Partnership, __ a Texas Joint Venture, or __ an Individual.

Address: _____ Contractor's #: _____
City _____ State _____ Zip Code _____

2. Years in business under present business name: _____

3. Years of experience in construction work of the type called for in this Contract as: A General Contractor _____, A Sub-contractor _____.

4. Have you ever previously worked as a subcontractor for this General Contractor? _____
Yes; _____ No; If yes, list three most recent projects in which your company has served as a subcontractor to this General Contractor.

5. What projects has your organization completed? List most recent FIRST.

Contract	Type of Work	Date Completed	Owners Name and Address	Amount

6. What projects does your organization have under way as of this date?

Contract	Type of Work	Date Completed	Owners Name and Address	Amount

7. Have you ever failed to complete any work awarded to you?

___ Yes ___ No. If "Yes", state where and why. _____

8. Are you at present in any binding arbitrations and/or lawsuits involving construction work of any type?

___ Yes ___ No. If "Yes", explain: _____

9. Explain in detail the manner in which you have inspected the work and jobsite proposed in this contract: _____

10. Explain in detail your plan or layout for performing the work proposed in this contract:

11. If this subcontract is awarded to you by the general contractor, your company's office administrative manager for the work will be Mr. (Ms.) _____,

and your resident construction superintendent will be Mr. (Ms.) _____.

12. What experience in this type of work does the individual designated as resident superintendent above have? _____

13. What portions of the work do you intend to subtier subcontract?

14. What equipment do you own that is available for the proposed work?

Quantity	Description, Size Capacity, Etc.	Condition	Years in Service	Present Location

15. Have you received firm offers from suppliers or manufacturers for all major items of material and/or equipment within the price totals used in preparing your subcontractor bid?
 ___ Yes ___ No

16. Attach resumes for the principal members of your organization, including the officers as well as the proposed superintendent for the project.

Credit available: \$ _____ Bank Reference: _____

Bonding Capacity available: \$ _____

The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by either the Owner’s Engineer or Owner in verification of the recitals comprising this Subcontractor Pre-Bid Disclosure Statement.

The signatory of this questionnaire guarantees the truth and accuracy of all statements herein made and all answers herein expressed.

Dated this ____ day of _____, 20__.

By: _____

Title: _____

STATE OF _____

COUNTY OF _____

Subscribed and sworn to before me this ____ day of _____, 20__.

Notary Public

My commission expires: _____

REQUIRED FORMS CHECKLIST

The following documents are to be submitted as a part of the Bid/RFP/RFQ document

NAME	FORM DESCRIPTION	SUBMITTED WITH BID	
		YES <input type="checkbox"/>	NO <input type="checkbox"/>
Required Forms (if applicable)	Acknowledgement Form	<input type="checkbox"/>	<input type="checkbox"/>
	Debarment Certificate	<input type="checkbox"/>	<input type="checkbox"/>
	Ethic Statement	<input type="checkbox"/>	<input type="checkbox"/>
	Conflict of Interest Questionnaire	<input type="checkbox"/>	<input type="checkbox"/>
	W9 or W8 Form	<input type="checkbox"/>	<input type="checkbox"/>
	Direct Deposit Form (will be provided to the awarded vendor)	<input type="checkbox"/>	<input type="checkbox"/>
	Residence Certification Form	<input type="checkbox"/>	<input type="checkbox"/>
Special Instructions (if applicable)	Bid Schedule/Cost sheet completed and signed	<input type="checkbox"/>	<input type="checkbox"/>
	Cashier Check or Bid Bond of 5% of Total Amount of Bid	<input type="checkbox"/>	<input type="checkbox"/>
	OSHA 300 Log	<input type="checkbox"/>	<input type="checkbox"/>
	Contractor Pre-Bid Disclosure completed, signed and notarized	<input type="checkbox"/>	<input type="checkbox"/>
	Sub-Contractor Pre-Bid Disclosure completed, signed, and notarized	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>
References	Complete the Previous Customer Reference Worksheet for each reference provided	<input type="checkbox"/>	<input type="checkbox"/>
Addenda		<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>

Prospective Bidders are respectfully reminded to completely read and thoroughly respond to the BPUB Instructions for Bidders and Pre-Bid Disclosure Statement. When BPUB evaluates the Bids, it reviews indices regarding the prospective contractors' responsibility to perform the project based upon prior job performances for BPUB and other public owners. Additionally, BPUB carefully reviews the prospective contractors' responsiveness to the BPUB Bid Advertisement. Bidders should thoroughly check their submittal for completeness prior to responding to BPUB. Do not imbalance your Bid line items to overload portions of the work. Remember to answer all written questions in the Pre-Bid Disclosure Statement and then notarize it when signing. Bidders are often required to submit OSHA 300 Logs from prior job performance records as well. BPUB can, has, and will reject Bids that fail the responsibility and/or responsiveness standards so as to protect the integrity of the bidding process for all participants. The Bidding community's compliance with these guideline standards will be appreciated by the BPUB.

ETHICS STATEMENT
(Complete and return with bid)

The undersigned bidder, by signing and executing this bid, certifies and represents to the Brownsville Public Utilities Board that bidder has not offered, conferred or agreed to confer any pecuniary benefit, as defined by (1.07 (a) (6) of the Texas Penal Code, or any other thing of value as consideration for the receipt of information or any special treatment of advantage relating to this bid; the bidder also certifies and represents that the bidder has not offered, conferred or agreed to confer any pecuniary benefit or other thing of value as consideration for the recipient's decision, opinion, recommendation, vote or other exercise of discretion concerning this bid, the bidder certifies and represents that bidder has neither coerced nor attempted to influence the exercise of discretion by any officer, trustee, agent or employee of the Brownsville Public Utilities Board concerning this bid on the basis of any consideration not authorized by law; the bidder also certifies and represents that bidder has not received any information not available to other bidders so as to give the undersigned a preferential advantage with respect to this bid; the bidder further certifies and represents that bidder has not violated any state, federal, or local law, regulation or ordinance relating to bribery, improper influence, collusion or the like and that bidder will not in the future offer, confer, or agree to confer any pecuniary benefit or other thing of value of any officer, trustee, agent or employee of the Brownsville Public Utilities Board in return for the person having exercised their person's official discretion, power or duty with respect to this bid; the bidder certifies and represents that it has not now and will not in the future offer, confer, or agree to confer a pecuniary benefit or other thing of value to any officer, trustee, agent, or employee of the Brownsville Public Utilities Board in connection with information regarding this bid, the submission of this bid, the award of this bid or the performance, delivery or sale pursuant to this bid.

THE VENDOR/CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD HARMLESS THE CITY OF BROWNSVILLE AND THE BROWNSVILLE PUBLIC UTILITIES BOARD, ALL OF THEIR OFFICERS, AGENTS AND EMPLOYEES FROM AND AGAINST ALL CLAIMS, ACTIONS, SUITS, DEMANDS, PROCEEDINGS, COSTS, DAMAGES, AND LIABILITIES, ARISING OUT OF, CONNECTED WITH, OR RESULTING FROM ANY NEGLIGENT ACTS OR OMISSIONS OF CONTRACTOR OR ANY AGENT, EMPLOYEE, SUBCONTRACTOR, OR SUPPLIER OF CONTRACTOR IN THE EXECUTION OR PERFORMANCE OF THIS BID.

I have read all of the specifications and general bid requirements and do hereby certify that all items submitted meet specifications.

COMPANY: _____

AGENT NAME: _____

AGENT SIGNATURE: _____

ADDRESS: _____

CITY: _____

STATE: _____ ZIP CODE: _____

TELEPHONE: _____ TELEFAX: _____

FEDERAL ID#: _____ AND/OR SOCIAL SECURITY #: _____

DEVIATIONS FROM SPECIFICATIONS IF ANY:

NOTE: QUESTIONS AND CONCERNS FROM PROSPECTIVE CONTRACTORS SHOULD BE RAISED WITH OWNER AND ITS CONSULTANT (IF APPLICABLE) AND RESOLVED IF POSSIBLE, PRIOR TO THE BID SUBMITTAL DATE. ANY LISTED DEVIATIONS IN A FINALLY SUBMITTED BID MAY ALLOW THE OWNER TO REJECT A BID AS NON-RESPONSIVE.

CERTIFICATION REGARDING DEBARMENT, SUSPENSION,
AND OTHER RESPONSIBILITY MATTERS
(Complete and Return with Bid)

Name of Entity: _____

The prospective participant certifies to the best of their knowledge and belief that they and their principals:

- a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- b) Have not within a three (3) year period preceding this bid 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, Local) with commission of any of the offenses enumerated in paragraph (b) of this certification; and
- d) Have not within a three (3) year period preceding this bid had one or more public transactions (Federal, State, Local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this bid or termination of the award. In addition, under 18 USC Section 1001, a false statement may result in a fine up to a \$10,000.00 or imprisonment for up to five (5) years, or both.

Name and Title of Authorized Representative (Typed)

Signature of Authorized Representative

Date

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

EPA FORM 5700-49 (11-88)

THIS FORM MUST BE COMPLETED IN ITS ENTIRETY & SUBMITTED WITH BID RESPONSE

CONFLICT OF INTEREST QUESTIONNAIRE For vendor doing business with local governmental entity		FORM CIQ
<p>This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.</p> <p>This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).</p> <p>By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. See Section 176.006(a-1), Local Government Code.</p> <p>A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.</p>	OFFICE USE ONLY	
<p>1 Name of vendor who has a business relationship with local governmental entity.</p>	Date Received 	
<p>2 <input type="checkbox"/> Check this box if you are filing an update to a previously filed questionnaire. (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)</p>		
<p>3 Name of local government officer about whom the information is being disclosed.</p> <p style="text-align: center;">_____</p> <p style="text-align: center;">Name of Officer</p>		
<p>4 Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.</p> <p style="text-align: center; margin-top: 20px;">A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?</p> <p style="text-align: center;"> <input type="checkbox"/> Yes <input type="checkbox"/> No </p> <p style="text-align: center; margin-top: 10px;">B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?</p> <p style="text-align: center;"> <input type="checkbox"/> Yes <input type="checkbox"/> No </p>		
<p>5 Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.</p>		
<p>6 <input type="checkbox"/> Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).</p>		
<p>7</p> <p style="text-align: center; margin-top: 20px;"> _____ Signature of vendor doing business with the governmental entity </p> <p style="text-align: right; margin-top: 20px;"> _____ Date </p>		

Form provided by Texas Ethics Commission

www.ethics.state.tx.us

Revised 1/1/2021

CONFLICT OF INTEREST QUESTIONNAIRE
For vendor doing business with local governmental entity

A complete copy of Chapter 176 of the Local Government Code may be found at <http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.176.htm>. For easy reference, below are some of the sections cited on this form.

Local Government Code § 176.001(1-a): "Business relationship" means a connection between two or more parties based on commercial activity of one of the parties. The term does not include a connection based on:

- (A) a transaction that is subject to rate or fee regulation by a federal, state, or local governmental entity or an agency of a federal, state, or local governmental entity;
- (B) a transaction conducted at a price and subject to terms available to the public; or
- (C) a purchase or lease of goods or services from a person that is chartered by a state or federal agency and that is subject to regular examination by, and reporting to, that agency.

Local Government Code § 176.003(a)(2)(A) and (B):

(a) A local government officer shall file a conflicts disclosure statement with respect to a vendor if:

(2) the vendor:

(A) has an employment or other business relationship with the local government officer or a family member of the officer that results in the officer or family member receiving taxable income, other than investment income, that exceeds \$2,500 during the 12-month period preceding the date that the officer becomes aware that

- (i) a contract between the local governmental entity and vendor has been executed;
- or
- (ii) the local governmental entity is considering entering into a contract with the vendor;

(B) has given to the local government officer or a family member of the officer one or more gifts that have an aggregate value of more than \$100 in the 12-month period preceding the date the officer becomes aware that:

- (i) a contract between the local governmental entity and vendor has been executed; or
- (ii) the local governmental entity is considering entering into a contract with the vendor.

Local Government Code § 176.006(a) and (a-1)

(a) A vendor shall file a completed conflict of interest questionnaire if the vendor has a business relationship with a local governmental entity and:

- (1) has an employment or other business relationship with a local government officer of that local governmental entity, or a family member of the officer, described by Section 176.003(a)(2)(A);
- (2) has given a local government officer of that local governmental entity, or a family member of the officer, one or more gifts with the aggregate value specified by Section 176.003(a)(2)(B), excluding any gift described by Section 176.003(a-1); or
- (3) has a family relationship with a local government officer of that local governmental entity.

(a-1) The completed conflict of interest questionnaire must be filed with the appropriate records administrator not later than the seventh business day after the later of:

(1) the date that the vendor:

- (A) begins discussions or negotiations to enter into a contract with the local governmental entity; or
- (B) submits to the local governmental entity an application, response to a request for proposals or bids, correspondence, or another writing related to a potential contract with the local governmental entity; or

(2) the date the vendor becomes aware:

- (A) of an employment or other business relationship with a local government officer, or a family member of the officer, described by Subsection (a);
- (B) that the vendor has given one or more gifts described by Subsection (a); or
- (C) of a family relationship with a local government officer.

BROWNSVILLE PUBLIC UTILITIES BOARD
RESIDENCE CERTIFICATION

In accordance with Chapter 2252 of the Texas Government Code, the following will apply. The pertinent portion of the Code has been extracted and is as follows:

Section 2252.001

- (3) "Nonresident bidder" refers to a person who is not a resident of Texas.
- (4) " Resident bidder " refers to a person whose principal place of business is in this State, including a contractor whose ultimate parent company or majority owner has its place of business in this State.

Section 2252.002

A governmental entity may not award a governmental contract to a nonresident bidder unless the nonresident bidder underbids the lowest bid submitted by a responsible resident bidder by an amount that is not less than the amount by which a resident bidder would be required to underbid the nonresident bidder to obtain a comparable contract in:

- (1) The state in which the nonresident's principal place of business is located; or
- (2) A state in which the nonresident is a resident manufacturer.

I certify that _____ (Company Name)
is a **resident Texas bidder** as defined in Section 2252.001(4) of the Texas Government Code.

Signature: _____

Print Name: _____

I certify that _____ (Company Name)
is a **nonresident bidder** as defined in Section 2252.001(3) of the Texas Government Code and
our principal place of

business is: _____
(City and State)

Signature: _____

Print Name: _____

Previous Customer Reference Worksheet

Name of Customer:		Customer Contact:
Customer Address:		Customer Phone Number:
		Customer Email:
Name of Company Performing Referenced Work:		
Provide a brief description of the work performed for this customer (add additional page if required)		

What was the Period of Performance?		What was the Final Acceptance Date?
From:		
To:		
Dollar Value of Contract? \$ _____		What Type of Contract? <input type="checkbox"/> Firm Fixed Price <input type="checkbox"/> Time and Material <input type="checkbox"/> Not to Exceed <input type="checkbox"/> Cost Plus Fixed Fee <input type="checkbox"/> Other, Specify:

**Request for Taxpayer
Identification Number and Certification**

**Give Form to the
requester. Do not
send to the IRS.**

▶ Go to www.irs.gov/FormW9 for instructions and the latest information.

Print or type. See Specific Instructions on page 3.	1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.	
	2 Business name/disregarded entity name, if different from above	
	3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only one of the following seven boxes. <input type="checkbox"/> Individual/sole proprietor or single-member LLC <input type="checkbox"/> C Corporation <input type="checkbox"/> S Corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Trust/estate <input type="checkbox"/> Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ▶ _____ <small>Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is another LLC that is not disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner.</small> <input type="checkbox"/> Other (see instructions) ▶ _____	4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3): Exempt payee code (if any) _____ Exemption from FATCA reporting code (if any) _____ <small>(Applies to accounts maintained outside the U.S.)</small>
	5 Address (number, street, and apt. or suite no.) See instructions.	Requester's name and address (optional)
	6 City, state, and ZIP code	
	7 List account number(s) here (optional)	

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN*, later.

Note: If the account is in more than one name, see the instructions for line 1. Also see *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number										
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or										
Employer identification number										
<table style="width:100%; border-collapse: collapse;"> <tr> <td style="width:10%; border: 1px solid black; height: 20px;"></td> <td style="width:10%; border: 1px solid black; height: 20px;"></td> <td style="width:10%; border: 1px solid black; height: 20px;"></td> <td style="width:10%; border: 1px solid black; height: 20px;"></td> <td style="width:10%; border: 1px solid black; height: 20px;"></td> <td style="width:10%; border: 1px solid black; height: 20px;"></td> <td style="width:10%; border: 1px solid black; height: 20px;"></td> <td style="width:10%; border: 1px solid black; height: 20px;"></td> <td style="width:10%; border: 1px solid black; height: 20px;"></td> <td style="width:10%; border: 1px solid black; height: 20px;"></td> </tr> </table>										

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here	Signature of U.S. person ▶	Date ▶
------------------	----------------------------	--------

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to www.irs.gov/FormW9.

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)

- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, later.

Form **W-8BEN-E**

(Rev. October 2021)
Department of the Treasury
Internal Revenue Service

**Certificate of Status of Beneficial Owner for
United States Tax Withholding and Reporting (Entities)**

► For use by entities. Individuals must use Form W-8BEN. ► Section references are to the Internal Revenue Code.
► Go to www.irs.gov/FormW8BENE for instructions and the latest information.
► Give this form to the withholding agent or payer. Do not send to the IRS.

OMB No. 1545-1621

Do NOT use this form for:

- U.S. entity or U.S. citizen or resident W-9
- A foreign individual W-8BEN (Individual) or Form 8233
- A foreign individual or entity claiming that income is effectively connected with the conduct of trade or business within the United States (unless claiming treaty benefits) W-8ECI
- A foreign partnership, a foreign simple trust, or a foreign grantor trust (unless claiming treaty benefits) (see instructions for exceptions) W-8IMY
- A foreign government, international organization, foreign central bank of issue, foreign tax-exempt organization, foreign private foundation, or government of a U.S. possession claiming that income is effectively connected U.S. income or that is claiming the applicability of section(s) 115(2), 501(c), 892, 895, or 1443(b) (unless claiming treaty benefits) (see instructions for other exceptions) W-8ECI or W-8EXP
- Any person acting as an intermediary (including a qualified intermediary acting as a qualified derivatives dealer) W-8IMY

Instead use Form:

Part I Identification of Beneficial Owner

1 Name of organization that is the beneficial owner	2 Country of incorporation or organization
--	---

3 Name of disregarded entity receiving the payment (if applicable, see instructions)

4 Chapter 3 Status (entity type) (Must check one box only):

<input type="checkbox"/> Corporation	<input type="checkbox"/> Partnership
<input type="checkbox"/> Simple trust	<input type="checkbox"/> Tax-exempt organization
<input type="checkbox"/> Central Bank of Issue	<input type="checkbox"/> Private foundation
<input type="checkbox"/> Grantor trust	<input type="checkbox"/> Disregarded entity
<input type="checkbox"/> Estate	<input type="checkbox"/> Foreign Government - Controlled Entity
<input type="checkbox"/> International organization	<input type="checkbox"/> Foreign Government - Integral Part

If you entered disregarded entity, partnership, simple trust, or grantor trust above, is the entity a hybrid making a treaty claim? If "Yes," complete Part III. Yes No

5 Chapter 4 Status (FATCA status) (See instructions for details and complete the certification below for the entity's applicable status.)

<input type="checkbox"/> Nonparticipating FFI (including an FFI related to a Reporting IGA FFI other than a deemed-compliant FFI, participating FFI, or exempt beneficial owner).	<input type="checkbox"/> Nonreporting IGA FFI. Complete Part XII.
<input type="checkbox"/> Participating FFI.	<input type="checkbox"/> Foreign government, government of a U.S. possession, or foreign central bank of issue. Complete Part XIII.
<input type="checkbox"/> Reporting Model 1 FFI.	<input type="checkbox"/> International organization. Complete Part XIV.
<input type="checkbox"/> Reporting Model 2 FFI.	<input type="checkbox"/> Exempt retirement plans. Complete Part XV.
<input type="checkbox"/> Registered deemed-compliant FFI (other than a reporting Model 1 FFI, sponsored FFI, or nonreporting IGA FFI covered in Part XII). See instructions.	<input type="checkbox"/> Entity wholly owned by exempt beneficial owners. Complete Part XVI.
<input type="checkbox"/> Sponsored FFI. Complete Part IV.	<input type="checkbox"/> Territory financial institution. Complete Part XVII.
<input type="checkbox"/> Certified deemed-compliant nonregistering local bank. Complete Part V.	<input type="checkbox"/> Excepted nonfinancial group entity. Complete Part XVIII.
<input type="checkbox"/> Certified deemed-compliant FFI with only low-value accounts. Complete Part VI.	<input type="checkbox"/> Excepted nonfinancial start-up company. Complete Part XIX.
<input type="checkbox"/> Certified deemed-compliant sponsored, closely held investment vehicle. Complete Part VII.	<input type="checkbox"/> Excepted nonfinancial entity in liquidation or bankruptcy. Complete Part XX.
<input type="checkbox"/> Certified deemed-compliant limited life debt investment entity. Complete Part VIII.	<input type="checkbox"/> 501(c) organization. Complete Part XXI.
<input type="checkbox"/> Certain investment entities that do not maintain financial accounts. Complete Part IX.	<input type="checkbox"/> Nonprofit organization. Complete Part XXII.
<input type="checkbox"/> Owner-documented FFI. Complete Part X.	<input type="checkbox"/> Publicly traded NFFE or NFFE affiliate of a publicly traded corporation. Complete Part XXIII.
<input type="checkbox"/> Restricted distributor. Complete Part XI.	<input type="checkbox"/> Excepted territory NFFE. Complete Part XXIV.
	<input type="checkbox"/> Active NFFE. Complete Part XXV.
	<input type="checkbox"/> Passive NFFE. Complete Part XXVI.
	<input type="checkbox"/> Excepted inter-affiliate FFI. Complete Part XXVII.
	<input type="checkbox"/> Direct reporting NFFE.
	<input type="checkbox"/> Sponsored direct reporting NFFE. Complete Part XXVIII.
	<input type="checkbox"/> Account that is not a financial account.

6 Permanent residence address (street, apt. or suite no., or rural route). Do not use a P.O. box or in-care-of address (other than a registered address).

City or town, state or province. Include postal code where appropriate.	Country
---	---------

7 Mailing address (if different from above)

City or town, state or province. Include postal code where appropriate.	Country
---	---------

NOTICE OF AWARD

TO: _____

**Project Description: WATER TREATMENT PLANT #2 FLOCCULATION BASIN
STRUCTURAL REPAIRS PROJECT B018-24**

Dear Sir/Madam:

The Owner, BPUB has considered the BID submitted by you for the above-described Work in response to its Legal Notice and Invitation to Bid dated January 9, 2024 and Instruction to Bidders.

You are hereby notified that after any Owner adjustments to the Base Bid Amount to account for Owner options regarding additive and deductive alternates, your BID has been accepted in the final Contract Price amount of \$_____.

You are required by the Instructions to Bidders to execute the Construction Agreement and furnish any required Contractor's Performance Bond, Payment Bond and Certificates of Insurance within ten (10) calendar days from the date you receive this Notice.

In addition with the Bonds and Insurance Certificates, you must complete, execute, and submit a Contractor Job Safety Analysis (JSA) form. The JSA form is required prior to entering into a contractual agreement with the OWNER, and will be valid for a period of thirty (30) calendar days after which you must complete, execute and submit an updated JSA form. The completed JSA form is included as a part of the Contract Documents.

If you fail to execute this Agreement and furnish any required Bonds, Insurance Certificates, or other certifications within ten (10) calendar days from the date of this Notice, Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your BID as abandoned, and as a forfeiture of your BID BOND.

The Owner will be entitled to such other rights as may be granted by law and equity.

You are required to promptly sign and return an acknowledged copy of this NOTICE OF AWARD to the Owner.

Dated this ____ day of _____, 20__.

BROWNSVILLE PUBLIC UTILITIES BOARD OF THE CITY OF BROWNSVILLE, TEXAS

By: _____
Name: Marilyn D. Gilbert, MBA
Title: General Manager / CEO

ACCEPTANCE OF NOTICE OF AWARD

Receipt of the above NOTICE OF AWARD is hereby acknowledged by:

_____ this ____ day
of _____, 20 ____.

By: _____

Name: _____

Title: _____

NOTICE TO PROCEED

TO:

ADDRESS:

**Contract for: WATER TREATMENT PLANT #2 FLOCCULATION BASIN
STRUCTURAL REPAIRS PROJECT B018-24**

You are notified that the Contract Time under the above Contract will commence to run on _____, 20___. By that date, you are to start performing your obligations under the Contract Documents. In accordance with the Agreement, the date of Substantial Completion prior to final payment is _____, 20__.

Before you may start any Work at the site, Bonds and Insurance Certificates along with certain material submittals must be submitted and approved by the BPUB before a BPUB Purchase Order is issued and prior to the purchase and shipment of Work materials.

Brownsville Public Utilities Board:
(Owner)

BY: _____
(Authorized Signature)
NAME: Marilyn D. Gilbert, MBA, P.E.
TITLE: General Manager/CEO
DATE: _____

CONSTRUCTION AGREEMENT

THIS AGREEMENT is by and between the BROWNSVILLE PUBLIC UTILITIES BOARD of the City of Brownsville, Texas (hereinafter called OWNER or BPUB) and <CONTRACTOR NAME> of <CITY & STATE> (hereinafter called CONTRACTOR), performing as an independent contractor.

OWNER and CONTRACTOR, as the Parties hereto, in consideration of the mutual covenants hereinafter set forth, agree as follows:

Article 1. WORK.

CONTRACTOR shall furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the Work described herein and complete all the Work as specified or indicated in the Contract Documents. The Work is generally described as: South Wastewater Treatment Plant Improvements (hereinafter referred to as "Work" and/or "Project").

Article 2. ENGINEER.

The Project has been designed by OWNER'S independent professional engineering consultant(s): Carollo Engineers, Inc. (hereinafter called ENGINEER).

Article 3. CONTRACT TIME.

3.1 The Work shall be Substantially Completed in accordance with paragraph 14.8 of the General Conditions within Ninety (90) consecutive Calendar Days after the date when the Contract Time commences to run as provided in paragraph 2.3 of the General Conditions, and finally completed and ready for final payment in accordance with paragraph 14.13 of the General Conditions within thirty (30) consecutive Calendar Days after the date of Substantial Completion as established in accordance with paragraph 14.8 of the General Conditions.

CONTRACTOR hereby acknowledges and agrees that the ENGINEER has already included in the calculation of the performance Calendar Days, normal, monthly, non-compensable rain days for Cameron County, Texas, based upon historical monthly National Oceanic and Atmospheric Administration (NOAA) record averages.

3.2 **Liquidated Damages.** OWNER and CONTRACTOR recognize that the **TIME OF PERFORMANCE IS OF THE ESSENCE** in this Agreement and that OWNER will suffer financial loss if the Work is not Substantially Complete within the time specified in Article 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. Both Parties hereto also recognize the delays, expense and difficulties involved in proving in a legal proceeding the actual loss suffered by OWNER if the Work is not Substantially Complete on time. Accordingly, instead of requiring such proof, OWNER and CONTRACTOR agree that as liquidated damages for the delay (but not as a penalty) CONTRACTOR shall pay OWNER **FIVE HUNDRED DOLLARS AND NO CENTS (\$500.00)** for each Calendar Day

that expires after the time specified in Article 3.1 for Substantial Completion, until the Work is Substantially Complete.

Article 4. CONTRACT PRICE.

4.1 CONTRACTOR shall perform the Work described in the Contract Documents for the amounts shown in the CONTRACTOR'S Bid Schedule, and OWNER shall pay CONTRACTOR in current funds based on the Bid Schedule.

Article 5. PAYMENT PROCEDURES.

CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by OWNER as provided for in the General Conditions.

5.1 **Progress Payments.** OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's mathematically correct Applications for Payment on or about the twentieth-fifth (25th) Calendar Day after submittal of the Application for Payment each month as provided below. All progress payments shall be on the basis of the progress of the Work measured by the Schedule of Values provided for in paragraph 14.1 of the General Conditions.

5.1.2. Prior to Substantial Completion, progress payments shall be in an amount equal to ninety-five percent (95%) of the amount requested in the Application for Payment, with five percent (5%) remaining as OWNER's retainage for the Project, to be released by OWNER in accordance with Article 5.2 below.

5.1.3. Upon Substantial Completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to ninety-five percent (95%) of the Contract Price, less such amounts OWNER shall determine in accordance with paragraphs 14.7 and 14.8 of the General Conditions.

5.2 **Final Payment.** Upon final completion and acceptance of the Work after resolution of any punch list items in accordance with paragraph 14.8 and 14.13 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by Engineer as provided in said paragraphs 14.13.

Article 6. CONTRACTOR'S REPRESENTATIONS.

In order to induce OWNER to enter into this Agreement, CONTRACTOR makes the following representations to OWNER:

6.1 CONTRACTOR has familiarized himself with the Project, nature and extent of the Contract Documents, Work, and with all local conditions and federal, state and local laws, ordinances, rules and regulations that in any manner may affect cost, progress or performance of the Work.

6.2 CONTRACTOR has made, or caused to be made, examinations and investigations of information as he deems necessary for the performance of the Work at the Contract Price, as determined by the Bid Schedule and finalized Schedule of Values as determined by Article 2 of the General Conditions, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents; and no additional examinations, investigations or similar data are, or will be required by CONTRACTOR for such purposes.

6.3 CONTRACTOR has given OWNER advanced written notice of all obvious conflicts, errors or discrepancies that he has discovered in the Contract Documents prior to bidding, and the written resolution thereof by OWNER was acceptable to CONTRACTOR.

6.4 CONTRACTOR is skilled and experienced to responsibly perform the type of Work described in the Contract Documents in a workmanlike and timely manner.

Article 7. CONTRACT DOCUMENTS.

The Contract Documents which comprise the entire Agreement between OWNER and CONTRACTOR are attached to this Construction Agreement, made a part hereof, and consist of the following:

- 7.1 Legal Notice and Invitation to Bid
- 7.2 Instructions to Bidders
- 7.3 Bid Forms and Bid Schedule
- 7.4 Bid Bond
- 7.5 Contractor's and Subcontractor's Pre-Bid Disclosure Statements
- 7.6 Notice of Award and Acceptance of Notice
- 7.7 Notice to Proceed
- 7.8 This Construction Agreement
- 7.9 Performance Bond
- 7.10 Payment Bond
- 7.11 General Conditions
- 7.12 Supplementary General Conditions
- 7.13 Technical Specifications
- 7.14 Addendum number(s) __ (page __).
- 7.15 CONTRACTOR's Certificate(s) of Insurance.
- 7.16 Construction Drawings bearing the following general title: B018-24 WATER TREATMENT PLANT #2 FLOCCULATION BASIN STRUCTURAL REPAIRS PROJECT (Total Number of Drawing Sheets 1 through 13)
- 7.17 Any Written Amendment, including Change Orders, duly delivered after execution of this Agreement.

There are no Contract Documents other than those listed above in this Article 7. The Contract Documents may only be altered, amended or repealed by a Written Amendment (as defined in Article 1 of the General Conditions).

Article 8. MISCELLANEOUS.

8.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions shall have the meanings indicated in the General Conditions.

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

8.3 OWNER and CONTRACTOR each binds himself, his partners, successors, assigns and legal representatives to the other Party hereto, his partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

8.4 The invalidity or unenforceability of any provision of the Contract Documents shall not affect the validity or enforceability of any other provision of the Contract Documents.

8.5 This Construction Agreement and the Contract Documents are subject to all applicable local, Texas, federal laws, statutes, codes, ordinances, rules and regulations.

8.6 In the event of default by CONTRACTOR under the Contract Documents, OWNER shall have all rights and remedies afforded to it at law or in equity to enforce the terms of the Contract Documents. The exercise of any one right or remedy shall be without prejudice to the enforcement of any other right or remedy allowed at law or in equity.

8.7 If any action at law or in equity is necessary by OWNER to enforce or interpret the terms of the Contract Documents, OWNER shall be entitled to reasonable attorneys' fees, court costs, expert witness fees, and any necessary and reasonable supporting disbursements, in addition to any other relief to which the OWNER is entitled.

8.8 The Contract Documents constitute the **ENTIRE AGREEMENT BETWEEN THE PARTIES** hereto and supersede any prior written or oral agreements and understandings between the Parties. The Contract can only be modified or amended by written agreement of the Parties.

8.9 These Contract Documents are governed by the laws of the State of Texas and the Parties agree that venue for any litigation/arbitration/mediation arising from these Contract Documents shall lie in Cameron County, Texas.

Article 9. OTHER REQUIREMENTS

- 9.1 Workers' Compensation Insurance (For additional detail see: General Conditions paragraphs 5.3.1 and 5.5.1-2)
- A. By signing this Agreement, CONTRACTOR certifies that it provides workers' compensation insurance coverage for all employees employed on this Project pursuant to Tex. Lab. Code Sections 401 and 406.096(a).
 - B. As required by Section 406.096(b) of same Code, CONTRACTOR must require each Subcontractor to certify in writing to the CONTRACTOR that the Subcontractor provides workers' compensation insurance coverage for all of the employees it employs on this Project. CONTRACTOR must provide these certifications to the OWNER within ten (10) calendar days of the Effective Date of this Agreement.
- 9.2 Prohibition of Contracts with Companies Engaged in Business with Iran, Sudan, or Foreign Terrorist Organizations
- A. See: Tex. Gov't Code Section 2252.152, Subchapter F, which prohibits the award of governmental contracts to companies engaged in business with Iran, Sudan, or foreign terrorist organizations.
 - B. By signing this Agreement, CONTRACTOR certifies that it is not ineligible to be awarded this Contract under said Chapter 2252, Subchapter F.
- 9.3 Prohibition of Contracts with Certain Companies that Boycott Israel
- A. See: Tex. Gov't Code Chapter 2271 which prohibits the award of governmental contracts to companies boycotting Israel.
 - B. By signing this Agreement, CONTRACTOR certifies that it does not boycott Israel and will not boycott Israel during the term of this Contract.
- 9.4 Certificate of Interested Parties: CONTRACTOR must complete and submit a Certificate of Interested Parties (Form 1295) to the OWNER with the signed Agreement as required by Tex. Gov't Code Section 2252.908(e).

(THE REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK)

IN WITNESS WHEREOF, the Parties hereto have signed this Construction Agreement in triplicate originals. One counterpart each has been delivered to OWNER and CONTRACTOR, and the third will be filed with the ENGINEER.

This Construction Agreement will be Effective on _____, 20__, the date when OWNER signs below.

[NOTE: THE DATE OF THE PAYMENT AND PERFORMANCE BONDS CANNOT PRECEDE THIS EFFECTIVE CONTRACT DATE.]

BROWNSVILLE
PUBLIC UTILITIES BOARD

<CONTRACTOR>

By: _____

By: _____

Name: Marylin D. Gilbert, MBA

Name: _____

Title: BPUB General Manager & CEO

Title: _____

Signature Date: _____

Signature Date: _____

Attest: _____

Attest: _____

Address for giving notices:

Address for giving notices:

Attn: _____

Attn: _____

1425 Robinhood Drive

Brownsville, TX 78521

(956) 983-6275

MLeal@brownsville-pub.com

CONTRACTOR hereby acknowledges and understands that this is a “separated contract” pursuant to 34 Texas Administrative Code 3.291. The following amount of money represents that part of the total Contract Price representative of the value of tangible personal property to be physically incorporated into the Project realty: \$ _____.

[NOTE: SEE GENERAL CONDITIONS PARAGRAPH 6.16, “Taxes”, and “STATE SALES AND USE TAX EXEMPTION.”]

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

THAT _____
(Name of Contractor as Principal)

(Address of Contractor)

a _____
(corporation, partnership, or individual)

hereinafter called Principal, and

(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto the PUBLIC UTILITIES BOARD of the City of Brownsville, Texas, hereinafter called OWNER as Obligee, in the penal sum of _____ Dollars (\$ _____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain Contract with the OWNER, dated the ____ day of _____, 20____, a copy of which is hereto attached and made a part hereof, for the construction of the Project: **WATER TREATMENT PLANT #2 FLOCCULATION BASIN STRUCTURAL REPAIRS PROJECT.**

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the one (1) year post-construction workmanship guaranty and minimum materials/equipment warranty period, and if he shall satisfy all claims and demands incurred under such Contract, and **SHALL FULLY INDEMNIFY AND SAVE HARMLESS THE OWNER FROM ALL COSTS AND DAMAGES WHICH IT MAY SUFFER BY REASON OF FAILURE TO DO SO**, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received, hereby stipulates and agrees: that no written change, extension of time, alteration or addition to the terms of the Contract or to Project Work to be performed thereunder, or the Specifications accompanying the same, shall in any ways affect its obligation on this PERFORMANCE BOND, and it does hereby waive notice

of any such written change, extension of time, alteration or addition to the terms of the Contract, or to the Project Work, or to the Specifications.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose timely filed and legally perfected claim may be unsatisfied.

This PERFORMANCE BOND is subject to and governed by Sections 2253.01-079 of the Texas Government Code (Vernon's Texas Codes Annotated) and Chapter 3503 of the Texas Insurance Code (VTCA), and all amendments thereto.

IN WITNESS WHEREOF, this instrument is executed in triplicate originals, each counterpart of which shall be deemed an original, this the ____ day of _____, 20__.

A. ATTEST:

(Principal)

(Principal) Secretary

By: _____(s)
(Signature of legally authorized representative of Principal)
Print Name _____
Print Title _____

(SEAL)

(Witness as to Principal)

(Address)

(Address)

B. ATTEST:

(Surety)

(Surety) Secretary

By: _____
(Signature of Attorney-in-Fact for Surety)
Print Name _____

(SEAL)

(Witness as to Surety)

(Address)

(Address)

NOTE: Date of PERFORMANCE BOND must not be prior to Effective Date (execution date by OWNER) of Contract. If CONTRACTOR is a Partnership, all partners should execute PERFORMANCE BOND.

IMPORTANT: Surety companies executing PERFORMANCE BONDS must be legally authorized by the Texas State Board of Insurance to transact business in the State of Texas, and be currently listed as an approved federal surety in the most recently issued edition (prior to Contract's Effective Date) of the U. S. Treasury Circular 570.

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

THAT _____
(Name of Contractor as Principal)

(Address of Contractor)

a _____
(corporation, partnership, or individual)

hereinafter called Principal, and

(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto the PUBLIC UTILITIES BOARD of the City of Brownsville, Texas, hereinafter called OWNER as Obligee, the penal sum of _____ Dollars (\$ _____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain Contract with the OWNER, dated the ____ day of _____, 20____, a copy of which is hereto attached and made a part hereof, for the construction of the: **WATER TREATMENT PLANT #2 FLOCCULATION BASIN STRUCTURAL REPAIRS PROJECT.**

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, SUBCONTRACTORS, and corporations furnishing materials for, or performing labor in the prosecution of the WORK provided for in such Contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and all insurance premiums on said WORK, and for all labor, performed in such WORK, whether by SUBCONTRACTORS or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to WORK to be performed thereunder, or the SPECIFICATIONS accompanying the same, shall in any wise affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract, or to the WORK, or to the Specifications.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge any remaining, timely and legally perfected right of any lawful beneficiary hereunder, whose timely filed and legally perfected claim may be unsatisfied.

This Bond is subject to and governed Sections 2253.01 of the Texas Government Code (Vernon's Texas Codes Annotated) and Chapter 3503 of the Texas Insurance Code (VTCA), and all amendments thereto.

IN WITNESS WHEREOF, this instrument is executed in triplicate, each counterpart of which shall be deemed an original, this the ____ day of _____, 20__.

ATTEST: _____
(Principal)

(Principal) Secretary By: _____ (s)
(Signature)

(SEAL)

(Witness as to Principal) _____
(Address)

(Address)

ATTEST: _____
(Surety)

(Surety) Secretary By: _____
(Attorney-in-Fact)

(SEAL)

(Witness as to Surety) _____
(Address)

(Address)

NOTE: Date of PAYMENT BOND must not be prior to Effective Date (execution date by OWNER) of Contract. If Contractor is a Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing PAYMENT BONDS must be legally authorized by the Texas Board of Insurance to transact business in the State of Texas, and be currently listed as an approved federal surety in the most recently issued edition (prior to Contract's Effective Date) of the U. S. Treasury Circular 570.

ATTACH POWER OF ATTORNEY

INSERT CERTIFICATE OF INSURANCE

**GENERAL CONDITIONS
OF THE
CONSTRUCTION CONTRACT**

Prepared by
The Public Utilities Board of the City of Brownsville, Texas,
as a periodically reviewed and revised
Adaptation From the 1983 Base Document Prepared by

Engineers' Joint Contract Documents Committee

and originally

Issued and Published Jointly By:

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
A practice division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

AMERICAN CONSULTING ENGINEERS COUNCIL

AMERICAN SOCIETY OF CIVIL ENGINEERS

CONSTRUCTION SPECIFICATION INSTITUTE

The base document from which this adaptation (Spring 2020 BPUB) was prepared
(1983 edition) was approved and endorsed by:

The Associated General Contractors of America

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GENERAL CONDITIONS

SCOPE. The Standard General Conditions of the Construction Contract prepared by the National Society of Professional Engineers (NSPE-1910-8, 1983 Edition) as periodically amended and adapted by the OWNER to meet local requirements, shall form a part of this Contract, together with the following Supplementary General Conditions. A copy of the locally amended Standard General Conditions (based upon NSPE-1910-8) is bound herewith. The following supplements modify, change, delete, or add to the General Conditions. Where any part of the General Conditions is modified or voided by any Supplementary General Conditions, the unaltered provisions of that part shall remain in effect.

ARTICLE 1. DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural, male and female thereof:

Addenda - Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the bidding documents or the Contract Documents. These Addenda are a part of the Contract Documents and modify the Drawings, Specifications or other bid documents as indicated. No verbal changes in the Work not depicted or described in writing shall be binding.

Supplements to, changes in, or corrections to the Drawings and/or Specifications issued in writing by OWNER during the period of bidding. These Addenda are a part of the Contract and modify the Drawings and/or Specifications as indicated. No verbal changes in the Work as shown or described shall become binding.

Agreement - The written and signed short-form Construction Agreement (Contract or Agreement) between OWNER and CONTRACTOR covering the Work to be performed; other Contract Documents including these General Conditions are attached to the Construction Agreement and made a part thereof as provided therein.

Alternates. Additions to; deletions from; or changes to requirements for the Project, each of which shall be bid separately and shall be included in or deleted/deducted from the Contract at the discretion of OWNER.

Application for Payment - The form developed by OWNER which is to be used by CONTRACTOR in requesting interim progress or final Contract payments and which is to include such supporting documentation as is required by the Contract Documents.

Bid - The written offer or proposal of the bidder submitted on the OWNER prescribed form setting forth in figures and in script, the prices for the Work to be performed.

Bonds - Bid, Performance and Payment Bonds procured by the CONTRACTOR from a surety authorized by the Texas Department of Insurance to conduct business in the State of Texas, and any other instruments of security as may be specified by the OWNER.

Calendar Day –A calendar day consists of twenty-four hours and is measured from midnight, to the next midnight, and shall constitute a single calendar day. Calendar days include Saturdays and Sundays. THIS IS A CALENDAR DAY CONTRACT.

Change Order - A document developed by ENGINEER, which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion or revision to the Work, or an adjustment in the Contract Price and/or the Contract Time, issued after the Effective Date of the Construction Agreement. Executed Change Orders are part of the amended Contract Documents.

Contract Documents – The Legal Notice and Invitation to Bid; Instructions to Bidder(s); Pre-Bid Disclosure Statements; Notice of Award; Notice to Proceed; The Construction Agreement; Addenda (which pertain to the Contract Documents); CONTRACTOR's Bid (including documentation accompanying the Bid and any post-Bid documentation submitted prior to the Notice of Award); the Bid, Performance and Payment Bonds; these General Conditions; the Supplementary Conditions; the Specifications and the Drawings; and those documents enumerated in Article 7 of the Construction Agreement; and those outlined in paragraphs 3.4 and 3.5 of the General Conditions..

Contract Price - The moneys payable by OWNER to CONTRACTOR under the Contract Documents as stated in the Agreement (subject to the General Conditions provisions of paragraphs 9.1 and 11.9.1 in the case of Unit Price Work).

Contract Time - The number of days (“calendar” days computed as provided in General Conditions paragraph 17.2) or the date specifically stated in the Agreement for the Substantial Completion of the Work.

CONTRACTOR - The person, firm or corporation with whom OWNER has entered into the Agreement to construct the Work.

Defective - An adjective which when modifying the word "Work" refers to "Work" that is unsatisfactory, faulty or deficient, or does not conform to, or comply with the Contract Documents, or does not meet the requirements of any inspection, referenced standard, test or approval referred to in the Contract Documents, or has been damaged prior to the time OWNER makes the final payment (unless responsibility for the protection thereof has been assumed by OWNER at Substantial Completion in accordance with General Conditions paragraph 14.8 or 14.10).

Drawings - The drawings (plans) which depict the character, design, and scope of the Work to be performed and which have been prepared and/or approved by ENGINEER and are referred to in the Contract Documents.

Effective Date of the Agreement - The date indicated in the short-form Construction Agreement document upon which it becomes legally binding and effective, but if no such date is indicated, it means the date on which the Construction Agreement is signed by OWNER.

Engineer- The private, outside, independent professional engineering consulting firm(s) named as such in the Agreement.

Field Order - A written order issued by ENGINEER which orders minor changes or contains interpretations in the Work in accordance with General Conditions paragraph 9.5, but which does not involve a change in the Contract Price or the Contract Time.

Furnish. To supply at the Work jobsite the materials, supplies, equipment, etc., referred to in the Specifications and/or Drawings. Installation is not always required of the Supplier by the Specifications, but shall be performed or arranged for by the General CONTRACTOR.

General Requirements – Sections _____ of Division 1 of the Specifications.

Laws and/or Regulations - Federal and/or State Laws, rules, administrative agency regulations, local ordinances, local codes and/or court orders applicable to the Work performance.

Notice of Award - The written notice by OWNER to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein, within the time specified, OWNER will sign and deliver the Construction Agreement.

Notice to Proceed - A written notice given by OWNER to CONTRACTOR (with copy to ENGINEER) fixing the date on which the Contract Time will commence to run and on which CONTRACTOR shall start to perform CONTRACTOR's obligations under the Contract Documents.

OWNER'S Project Team (OPT) - The OWNER, OWNER'S Field Representative, ENGINEER, ENGINEER's Resident Project Representative, and the other entities identified in the Supplementary Conditions and the consultants, subconsultants, individuals or entities directly or indirectly employed or retained by them to provide services to the Owner.

OWNER - The City of Brownsville, acting through its Public Utilities Board (BPUB) of the City of Brownsville, Texas and its directly employed authorized representatives.

Partial Utilization - Placing a portion of the Work in service for the benefit of the OWNER and for the purpose for which it is intended (or a related purpose) before reaching Substantial Completion for all the Work.

Project – The construction of the Work to be provided to OWNER under the Contract Documents which may be the whole, or a part, as indicated elsewhere in the Contract Documents.

Provide – To furnish and install the materials, supplies, equipment, etc. referred to in the Specifications and/or Drawings, at the location shown or otherwise approved at the Project Work job-site.

Site Observers - Resident Project Representative - The authorized representative of ENGINEER who is assigned to periodically observe the Work at the site of the Project, or any part

thereof, on behalf of OWNER. OWNER'S Field Representative – the authorized representative of OWNER who observes the daily Work progress on behalf of OWNER. These two Representatives will coordinate with each other.

Shop Drawings - All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by, or for CONTRACTOR, to illustrate some portion of the Work, and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by CONTRACTOR to ENGINEER, to illustrate material or equipment for some portion of the Work.

Special Conditions – Those portions of the Contract Documents unique to this Project and often mandated by third-party regulatory and funding authorities.

Specifications - Those portions of the Contract Documents consisting of written technical descriptions for the design configuration and/or performance standard for materials, equipment, any specified construction systems, standards and workmanship, as applied to the Work and certain administrative details applicable thereto.

Standard Abbreviations. Wherever reference is made to standard specifications, standards of quality or performance, as established by a recognized national authority, the reference may be by initials and acronyms as generally recognized throughout the engineering and construction industries.

Subcontractor – An individual, firm or corporation having a direct contract with CONTRACTOR, or with any other Subcontractor (subtier), for the performance of a part of the Work at the Project site.

Substantial Completion - The Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER as evidenced by its ENGINEER's definitive written and signed certificate of Substantial Completion, and that it is apparently sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the OWNER's purposes for which it is intended; or if there is no such certificate issued by ENGINEER, when final payment is due in accordance with General Conditions paragraph 14.13. The terms "Substantially Complete" and "Substantially Completed" as applied to any Work refer to the Substantial Completion thereof.

Supplementary Conditions - The part of the Contract Documents which amends or supplements these General Conditions.

Supplier - A manufacturer, fabricator, supplier, distributor, materialman or third-party vendor.

Underground Facilities - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such manmade facilities or attachments, and any outer encasements containing such facilities (vaults, conduits) which have been installed underground to furnish/transport any of the following services or materials: electricity, gases, steam, liquid

petroleum products, telephone or other related data communications, cable television, sewage, storm drainage, traffic or other electronic control systems or potable water.

Unit Price Work - Work to be paid for on the basis of unit prices for ENGINEER/OWNER estimated quantities.

Work - The entire completed construction or the various separately identifiable parts thereof, required to be furnished by the CONTRACTOR under the Contract Documents. Work is the result of performing services, furnishing labor and furnishing and incorporating materials and equipment into the construction Project, all as required by the Contract Documents.

Work Directive Change - A written directive to CONTRACTOR, issued on or after the Effective Date of the Agreement and signed by OWNER, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed as provided in General Conditions paragraph 4.2 or 4.3 or to emergencies under General Conditions paragraph 6.24. A Work Directive Change may not change the Contract Price or the Contract Time, but is evidence that the parties expect that the change directed or documented by a Work Directive Change will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Time as provided in General Conditions paragraph 10.2.

Working Day. When and if applicable, a week day (Monday through Friday only, inclusive) in which weather conditions are such that Work can be performed in a normal manner. Weekends (Saturday, Sunday) and OWNER holidays shall not be considered working days.

Written Amendment - A written amendment of the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the non-engineering or non-technical (rather the commercial terms, legal provisions, etc.), rather than Work-related, aspects of the Contract Documents. Written Amendments are normally embodied in a Change Order once construction commences.

ARTICLE 2. PRELIMINARY MATTERS

Delivery of Bonds:

2.1 When CONTRACTOR delivers the triplicate original executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as CONTRACTOR may be required to furnish in accordance with paragraph 5.1.

Copies of Documents:

2.2 OWNER shall furnish to CONTRACTOR up to ten (10) copies (unless otherwise specified in the Supplementary Conditions) of the Contract Documents as are reasonably necessary for the execution of the Work. Additional copies will be furnished to CONTRACTOR, upon request, at the cost of reproduction reimbursable to OWNER.

Commencement of Contract Time; Notice to Proceed:

2.3 The Contract Time will commence to run and be accounted for on the date indicated in the Notice to Proceed. A Notice to Proceed may be given by OWNER at any time after the Effective Date of the Agreement. The CONTRACTOR should be prepared to perform Work as soon as Contract Time commences.

Starting the Project:

2.4 CONTRACTOR is obligated to perform the Work on the date when the Contract Time commences to run, but no Work shall be done at the Project site prior to the date on which the Contract Time commences to run per the Notice to Proceed.

Before Starting Construction:

2.5 Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby. CONTRACTOR shall be in **DEFAULT** to OWNER for failure to report to ENGINEER any obvious conflict, error, or discrepancy in the Contract Documents, if CONTRACTOR had actual knowledge thereof, or should reasonably have known thereof pursuant to customary construction industry standards.

2.6 Within ten (10) calendar days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for review:

2.6.1 an estimated Work Progress Schedule indicating the starting and completion dates of the various critical stages of the Work; and

2.6.2 a preliminary Schedule of Shop Drawing submissions; and

2.6.3 a preliminary Schedule of Values for all of the Work, which will include quantities and prices of items aggregating the total Contract Price and will subdivide the Work into logical component parts in sufficient detail to later serve as the basis for measuring actual Project progress and substantiating monthly payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work which will be automatically confirmed in writing by CONTRACTOR at the time of submission to ENGINEER.

2.7 By the tenth (10th) calendar day after award of the Contract by OWNER, CONTRACTOR shall deliver to OWNER (with copy to ENGINEER) original certificates (and any other evidence of insurance requested by OWNER) which CONTRACTOR is required to purchase and maintain in accordance with Article 5.

Preconstruction Conference:

2.8 After the Effective Date of the Agreement, but before CONTRACTOR starts the Work at the Project site, a mandatory conference attended by CONTRACTOR, ENGINEER, OWNER and others as appropriate, will be held to discuss the Schedules referred to in paragraph 2.6, to discuss procedures for managing exchanges of Shop Drawings and other submittals and for processing Applications for Payment; and to establish a working and pragmatic understanding among the Project participants as to the general progress and administration of the Work.

Finalizing Schedules:

2.9 At least ten (10) calendar days before submission of the first monthly Application for Payment, a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to finalize the various Schedules submitted in accordance with Article 2.6. The finalized Progress Schedule will be acceptable to ENGINEER as providing an orderly progression of the Work to completion within the Contract Time, but such acceptance will neither impose on ENGINEER responsibility for the progress or scheduling of the Work, nor relieve CONTRACTOR from full responsibility therefore. CONTRACTOR acknowledges the ENGINEER has already included in the calculation of the performance calendar days agreed to by CONTRACTOR by its Bid submission in this calendar day Contract, normal non-compensable monthly rain days for Cameron County, Texas. The CONTRACTOR shall update this Progress Schedule no less than monthly at each payment submittal. The CONTRACTOR shall only include in the submittal any abnormal and unusual rain days that exceed those typically experienced in Cameron County, Texas, based upon historical monthly National Oceanic and Atmospheric Administration (NOAA) record averages (rain days will be verified by the ENGINEER and the Site Observers weekly), and any OWNER approved time extensions in the modified Progress Schedule. The amended monthly Work Progress Schedule shall be reviewed and accepted by the ENGINEER and the OWNER monthly as a pre-condition to payment to CONTRACTOR. The finalized Schedule of Shop Drawing submissions will be acceptable to ENGINEER as providing a workable arrangement for processing the exchange of submissions. The finalized Schedule of Values will be acceptable to ENGINEER as to form and substance.

ARTICLE 3. CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

Intent:

3.1 The Contract Documents comprise the entire agreement between OWNER and CONTRACTOR concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of Cameron County, Texas.

3.2 It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents as being required of CONTRACTOR to produce the OWNER'S intended result will be supplied by CONTRACTOR, whether or not specifically called for. When words which have a well-known

technical or trade meaning are used to describe Work, materials or equipment, such words shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, whether such reference is specific or by implication, shall mean the latest amended standard specification, manual, code or Laws or Regulations in effect at the time of opening of Bids (or, on the Effective Date of the Construction Agreement, if there were no Bids for a specialty project), except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR, ENGINEER or any of their consultants, agents or employees from those set forth in the Contract Documents, nor shall it be effective to assign to ENGINEER, or any of ENGINEER's subconsultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of paragraphs 9.15 or 9.16. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER in writing as provided in paragraph 9.4.

3.3 If, during the performance of the Work, CONTRACTOR finds a conflict, error or discrepancy in the Contract Documents, CONTRACTOR shall immediately report same to ENGINEER in writing, and before proceeding with the Work affected thereby, shall obtain a written interpretation or clarification from ENGINEER. CONTRACTOR shall be in **DEFAULT** to OWNER for failure to report any obvious conflict, error or discrepancy in the Contract Documents if CONTRACTOR had actual knowledge thereof, or should reasonably have known thereof, pursuant to customary construction industry standards.

Amending and Supplementing Contract Documents:

3.4 The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following written ways:

- 3.4.1 a formal Written Amendment,
- 3.4.2 a Change Order (pursuant to definition and paragraph 10.4), or
- 3.4.3 a Work Directive Change (pursuant to definition and paragraph 10.1).

As indicated in paragraphs 11.2 and 12.1, Contract Price and Contract Time may only be changed by a Change Order or a Written Amendment.

3.5 In addition, the requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized in one or more of the following ways:

- 3.5.1 a Field Order (pursuant to definition and paragraph 9.5),

3.5.2 OWNER Engineer's approval of a Shop Drawing or sample (pursuant to definition and paragraphs 6.25 through 6.30), or

3.5.3 OWNER Engineer's written interpretation or clarification (pursuant to paragraph 9.4).

Reuse of Documents:

3.6 Neither CONTRACTOR, nor any Subcontractor (including sub-tier subcontractors) or Supplier, or other related person or organization performing or furnishing any of the Project Work to OWNER, shall have or acquire any title to, or ownership rights in, any of the Drawings, Specifications or other Contract Documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER, and they shall not reuse any of them on extensions of the Project or any other project without written consent of OWNER and ENGINEER, and specific written verification or adaptation by ENGINEER for a fee. All Drawings, Specifications or other Documents (or copies of any thereof) are upon completion of the Project to become the property of OWNER. Further use thereof without written consent of OWNER and ENGINEER is prohibited and solely at the risk of the user.

ARTICLE 4. AVAILABILITY OF LANDS: PHYSICAL CONDITIONS: REFERENCE POINTS

Availability of Lands:

4.1 OWNER shall furnish, as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way, licenses and easements for access thereto and such other lands which are specifically designated by OWNER for the use of CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by OWNER, unless otherwise provided in the Contract Documents. If CONTRACTOR believes that any delay in OWNER's furnishing of these lands, rights-of-way, licenses or easements entitles CONTRACTOR to an extension of the Contract Time, CONTRACTOR may make a claim therefore as provided in Article 12. CONTRACTOR may privately and separately provide at his own option and non-reimbursable cost, for any and all additional lands, and access thereto, that may be required for CONTRACTOR'S temporary construction facilities or storage of materials and equipment.

4.2 Physical Condition:

4.2.1 Explorations and Reports: Reference is made to the Supplementary Conditions for any identification of any reports of geotechnical explorations and tests of subsurface conditions at the Project site that may have been utilized by ENGINEER in preparation of the Contract Documents. Any of these geotechnical explorations and reports are expressly not part of these Contract Documents. CONTRACTOR may not rely upon the accuracy of the technical data contained in any such reports, nor upon non-technical data, interpretations or opinions contained therein or for the completeness thereof, for CONTRACTOR's purposes. Except as indicated in the immediately preceding sentence and in paragraph 4.2.6, CONTRACTOR shall have full

responsibility with respect to CONTRACTOR'S advanced, pre-bid exploration, testing and determining any CONTRACTOR risk and cost associated with encountering any subsurface conditions at the Project site.

4.2.2 Existing Structures: Reference is made to the Supplementary Conditions for any identification of those Drawings of physical conditions in or relating to existing surface or subsurface structures (except Underground Facilities referred to in paragraph 4.3) which are at or contiguous to the Project site that have been utilized by ENGINEER in preparation of the Contract Documents. CONTRACTOR may rely upon the accuracy of the technical data actually contained in such drawings, but not for the current physical conditions or description completeness thereof for CONTRACTOR's purposes. Except as indicated in the immediately preceding sentence and in paragraph 4.2.6, CONTRACTOR shall have full responsibility with respect to current locating, verification, investigation of, and encountering physical conditions in or relating to such structures.

4.2.3. Report of Differing Conditions: If CONTRACTOR believes that:

4.2.3.1 any technical data on which CONTRACTOR is entitled to rely as provided in paragraphs 4.2.1 and 4.2.2 is inaccurate, or

4.2.3.2 any physical condition uncovered or revealed at the Project site differs materially from that indicated, reflected or referred to in the Contract Documents,

CONTRACTOR shall, promptly after becoming aware thereof and before performing any Work in connection therewith (except in an emergency as permitted by paragraph 6.22), notify OWNER's Field Representative and ENGINEER's Resident Project Representative in writing about the inaccuracy or difference.

4.2.4 ENGINEER's Review: ENGINEER will promptly review the pertinent conditions, determine the necessity of obtaining any additional explorations or tests with respect thereto, and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER's findings and conclusions.

4.2.5 Possible Document Change: If ENGINEER concludes that there is a material error in the Contract Documents, or that because of newly discovered, latent physical conditions, a change in the Contract Documents is required, a Work Directive Change or a Change Order may be issued as provided in Article 10 to reflect and document the consequences of the inaccuracy or difference.

4.2.6 Possible Price and Time Adjustments: In each such case, an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, or any combination thereof, may be allowable to the extent that they are attributable to any such inaccuracy or difference. If OWNER and CONTRACTOR are unable to agree as to the financial impact or length thereof, a CONTRACTOR or OWNER claim may be made therefore as provided in Articles 11 and 12. All increases or decreases in the Contract Price shall be governed by all State and local statutes, codes, laws, ordinances, rules and regulations governing public competitive bidding and Change Orders.

Physical Conditions

4.3 Underground Facilities:

4.3.1 **Shown or Indicated:** The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Project site is only based on existing available information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities, (Non-OWNER utilities, pipeline companies, railroads, etc.) or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

4.3.1.1 OWNER and ENGINEER shall not be responsible for the actual current conditions, accuracy or completeness of any such third-party information or data; and,

4.3.1.2 CONTRACTOR shall have full responsibility before commencement of related Work for reviewing and checking all such current information and data; for locating all actual current Underground Facilities shown or indicated in the Contract Documents, for coordination of the Work with the owners of such Underground Facilities during construction; for the safety and protection thereof as provided in paragraph 6.20 and; paying for the repair of any damage thereto resulting from the Work; the cost of all of which is mutually considered between OWNER and CONTRACTOR as having been included in the CONTRACTOR'S original Contract Price.

4.3.2 Not Shown or Indicated: If an Underground Facility is uncovered or revealed at or contiguous to the Project site which was not shown or indicated in the Contract Documents, and which CONTRACTOR could not reasonably have been expected to be aware of under customary construction industry standards, CONTRACTOR shall, promptly after becoming aware thereof and before performing any Work affected thereby (except in an emergency as permitted by paragraph 6.22), identify the owner of such Underground Facility and give written notice thereof to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility to determine the extent to which the Contract Documents should be modified to reflect and document any consequences of the existence of the Underground Facility, and the Contract Documents may be amended or supplemented to the extent necessary. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility as provided in paragraph 6.20. CONTRACTOR may be allowed an increase in the Contract Price or an extension of the Contract Time, or both, to the extent that they are attributable to the existence of any Underground Facility that was not shown or indicated in the Contract Documents, and which CONTRACTOR could not reasonably have been expected to be aware of pursuant to customary construction industry standards. If the parties are unable to agree as to the financial impact or length thereof, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12. All increases or decreases in the Contract Price shall be governed by all State and local statutes, codes, laws, ordinances, rules and regulations governing public competitive bidding and Change Orders.

Reference Points:

4.4. CONTRACTOR shall be responsible for laying out the Work (unless otherwise specified by OWNER in the General Requirements), and shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of ENGINEER. CONTRACTOR shall report to ENGINEER whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations, and CONTRACTOR shall be responsible for the accurate replacement or relocation of such reference points by CONTRACTOR-retained professionally qualified personnel (not including OWNER or ENGINEER representatives).

ARTICLE 5. BONDS AND INSURANCE

Performance and Payment Bonds:

For a Contract in excess of \$100,000.00, a Performance Bond shall be procured and executed by CONTRACTOR in the full amount of the Contract Price conditioned upon the faithful performance of the Work for OWNER in accordance with the Plans, Specifications and Contract Documents. Said Bond shall be solely for the protection of the OWNER.

For a Contract in excess of \$50,000.00, a Payment Bond shall be executed in the full amount of the Contract Price, for the primary protection of all claimants against the surety for non-payment in supplying labor, materials and equipment in the prosecution of the Work provided for in the Contract, for the use of each such claimant timely perfecting a proper claim against surety.

5.1 CONTRACTOR shall furnish Performance and Payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance of the Work for OWNER and payment of all CONTRACTOR's labor, materials, equipment and supply obligations under the Contract Documents. **These Bonds shall remain in effect by CONTRACTOR at least until one year after the date when final payment becomes due**, except as otherwise provided by Law or Regulation or by the Contract Documents. CONTRACTOR shall also furnish any such other bonds as may be required by the Supplementary Conditions (e.g. any maintenance, extended warranty, special indemnity, etc.). All Bonds shall be in the forms prescribed by Law or Regulation or by the Contract Documents and be executed by such sureties as are authorized to do business in the State of Texas. All Bonds signed by an agent ("attorney in fact") must be accompanied by a certified copy of the authority to act on behalf of the surety.

5.2 If the surety on any Bond furnished by CONTRACTOR is declared a bankrupt or becomes insolvent, or its right to do business in Texas is terminated or it ceases to meet the requirements of paragraph 5.1, CONTRACTOR shall within five (5) calendar days thereafter substitute another Bond and surety, both of which must be acceptable to OWNER.

Contractor's Liability Insurance:

5.3 CONTRACTOR shall purchase and maintain such commercial general liability and other insurance coverages as are appropriate for the Work being performed and furnished, and as

will provide protection from claims set forth below which may arise out of, or result from, CONTRACTOR's performance and furnishing of the Work and CONTRACTOR's other obligations under the Contract Documents; whether it is to be performed or furnished by CONTRACTOR, by any Subcontractor, by anyone directly or indirectly employed by any of them to perform or furnish any of the Work; or by anyone for whose acts and/or omissions any of them may be liable:

5.3.1 Claims under workers' compensation, disability benefits and other similar employee benefit acts. This is a Texas public works Contract and any CONTRACTOR'S or Subcontractor's attempted rejection of the worker's compensation act, and thereby substituting a CONTRACTOR'S or Subcontractor's self-insurance reserve, is specifically prohibited by Texas law.

5.3.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees traditionally covered by employer's liability insurance;

5.3.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;

5.3.4 Claims for damages insured by personal injury liability coverage which are sustained: (a) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR; or (b) by any other person for any other reason;

5.3.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom;

5.3.6 Claims arising out of operation of Laws or Regulations for damages because of bodily injury or death of any person or for damage to property; and

5.3.7 Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any owned or hired motor vehicle.

The various insurance coverages required by this Article 5 shall include the specific type coverage and be underwritten for not less than the limits of liability and coverage amounts provided herein below or in the Supplementary Conditions, or required by law, whichever is greater. The commercial general liability insurance shall include completed operations insurance. All of the policies of insurance so required to be purchased and maintained (or the certificates or other evidence thereof) shall be of an "occurrence"-type, when applicable, and shall contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least (30) thirty days prior written notice has been given to OWNER by certified mail. All such insurance shall remain in effect until final payment and at all times thereafter when CONTRACTOR may be correcting, removing or replacing defective Work in accordance with paragraph 13.12. In addition, CONTRACTOR shall maintain such completed operations insurance for at least two (2) years after final payment and furnish OWNER with evidence of

continuation of such insurance at final payment and one year thereafter. Insurance coverage furnished under the Contract Documents (except for Workmen's Compensation and any professional engineering errors and omissions liability insurance that CONTRACTOR or his agent might carry applicable to this Project) shall include the City of Brownsville and BPUB as OWNER, and their respective City Commissioners, public officials, officers, Board Members, and employees, as named additional insureds and hereinafter known as "additional insureds."

The following entities are to also be specifically named as additional insureds:

1. City of Brownsville, Texas
Attn: City Secretary Griselda Rosas
City Plaza, First Floor
1034 E. Levee St.
Brownsville, Texas 78520

2. Brownsville Public Utilities Board
1425 Robinhood Drive
Brownsville, TX 78521

Contractual Liability Insurance:

5.4 The commercial general liability insurance required by paragraph 5.3 will include contractual liability insurance applicable to CONTRACTOR's INDEMNITY obligations under paragraphs 6.32 and 6.33.

5.5 Specific Coverages of Insurance Required by Owner:

5.5.1 Workmen's Compensation and Employer's Liability. This insurance shall protect the laborer, and insure the CONTRACTOR, and insulate the additional insureds, against all claims under applicable Texas workmen's compensation laws, pursuant to subparagraph 5.3.1. The additional insureds shall also be protected under an Employer's Liability policy against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a workmen's compensation law. This Employer's Liability policy shall include an "all states" endorsement.

5.5.2. **Mandatory TWCC Rule 28 TAC Sect. 110.110 Adapted Language**

(A) **Definitions:**

Certificate of coverage ("certificate") - A copy of a certificate of insurance, or a coverage agreement, showing statutory workers' compensation insurance coverage for the person's or entity's (CONTRACTOR's) employees providing services on this public works Project, for the duration of this Project.

"Duration of the Project" - includes the time from the beginning of the Work on this Project until the CONTRACTOR's/person's Work on this Project has been completed and accepted by the OWNER.

“Persons providing services on the Project” (“subcontractor” in § 406.096) - includes all persons or entities performing all or part of the services the CONTRACTOR has undertaken to perform on this Project, regardless of whether that person contracted directly with the CONTRACTOR and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on this Project.

"Services" - include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to this Project.

- (B) The CONTRACTOR shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, § 401.011(44) for all employees of the CONTRACTOR providing services on this Project, for the duration of this Project.
- (C) The CONTRACTOR must provide a certificate of coverage to the OWNER prior to being awarded the Contract.
- (D) If the coverage period shown on the CONTRACTOR'S current certificate of coverage ends during the duration of this Project, the CONTRACTOR must, prior to the end of the coverage period, file a new certificate of coverage with the OWNER showing that coverage has been extended.
- (E) The CONTRACTOR shall obtain from each person providing services on this Project, and provide to the OWNER:
 - (1) a certificate of coverage, prior to that person beginning Work on this Project, so the OWNER will have on file certificates of coverage showing coverage for all persons providing services on this Project; and
 - (2) no later than seven (7) calendar days after receipt by the CONTRACTOR, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of this Project.
- (F) The CONTRACTOR shall retain all required certificates of coverage for the duration of this Project and for three (3) years thereafter.
- (G) The CONTRACTOR shall notify the OWNER in writing by certified mail or personal delivery, within ten (10) calendar days after the CONTRACTOR knew or

should have known, of any change that materially affects the provision of coverage of any person providing services on this Project.

- (H) The CONTRACTOR shall post on this Project site a notice, in the text, form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on this Project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.
- (I) The CONTRACTOR shall contractually require each person with whom it contracts to provide services on this Project, to:
 - (1) provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, § 401.011(44) for all of its employees providing services on this Project, for the duration of this Project;
 - (2) provide to the CONTRACTOR, prior to that person beginning Work on this Project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on this Project, for the duration of this Project;
 - (3) provide the CONTRACTOR, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of this Project;
 - (4) obtain from each other person with whom it contracts, and provide to the CONTRACTOR:
 - (a) a certificate of coverage, prior to the other person beginning Work on this Project; and
 - (b) a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of this Project;
 - (5) retain all required certificates of coverage on file for the duration of this Project and for three (3) years thereafter;
 - (6) notify the OWNER in writing by certified mail or personal delivery, within ten (10) calendar days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on this Project; and

- (7) contractually require each person with whom it contracts, to perform as required by clauses (I)-(1-7) of this subparagraph, with the certificates of coverage to be provided to the person for whom they are providing services.
- (J) By signing this Contract or providing or causing to be provided a certificate of coverage, the CONTRACTOR is representing to the OWNER that all employees of the CONTRACTOR who will provide services on this Project will be covered by workers' compensation coverage for the duration of this Project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier. Providing false or misleading information may subject the CONTRACTOR to administrative penalties, criminal penalties, civil penalties, or other civil actions.
- (K) The CONTRACTOR's failure to comply with any of these provisions is a breach of Contract by the CONTRACTOR which entitles the OWNER to declare the Contract void if the CONTRACTOR does not remedy the breach within ten (10) calendar days after receipt of notice of breach from the OWNER.

The liability limits shall not be less than:

Workmen's compensation	Texas Statutory Limits
Employer's liability	\$100,000.00 each occurrence

5.5.3 Comprehensive Business Automobile Liability. This insurance shall be written in comprehensive business form and shall protect the CONTRACTOR and the additional insureds against all claims described under Section 5.3.7. of the General Conditions of the Contract Documents and arising from the use of motor vehicles, and shall cover, on or off the Project site, all motor vehicles licensed for highway use, whether they are owned, non-owned, or hired.

The liability limits shall not be less than:

Bodily Injury and property damage	\$500,000.00 combined single limit each occurrence
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5.5.4 Commercial General Liability. This insurance shall be an "occurrence" type policy written in commercial form and shall protect the CONTRACTOR and the additional insureds against all claims described in Sections 5.3, 5.3.3., 5.3.4., 5.3.5., 5.3.6, 5.4 of the General Conditions of the Contract Documents arising out of any intentional or negligent act and/or omission of the CONTRACTOR or his agents, employees, or subcontractors. This policy shall also include protection against claims insured by usual personal injury liability coverage.

The liability limits shall not be less than:

Personal Injury and property damage	\$1,000,000.00 combined single limit each occurrence and \$1,000,000.00 aggregate
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If the CONTRACTOR'S Work, or Work under his direction, requires blasting, explosive conditions, or underground operations, the commercial general liability coverage shall contain no exclusion relative to blasting, exploding, collapse of structures, or damage to underground property.

5.5.5 Excess Umbrella Liability Policy. This insurance shall protect the CONTRACTOR and the additional insureds against all claims in excess of the limits provided under the employer's liability, comprehensive business automobile liability, and commercial general liability policies. The liability limits of the umbrella policy shall not be less than \$2,000,000.00. The policy shall be an "occurrence" type policy.

5.5.6 Transportation Insurance. This insurance shall be of the "all risks" type and shall protect the CONTRACTOR and the OWNER from all insurable risks of physical loss or damage to equipment and materials in transit to the Project jobsite and until the OWNER receives the equipment and materials at the Project jobsite. The coverage amount shall be not less than one-half of the full amount of the total Contract Price.

Transportation insurance shall provide for losses to be payable to the CONTRACTOR and the OWNER as their respective legal interests may appear.

5.5.7 All policies required under paragraph 5.5 herein shall contain a "cross liability" or "severability of interest" clause or endorsement. Notwithstanding any other provision of these policies, the insurance afforded shall apply separately to each insured, named insured, or additional insured with respect to any claim, suit, or judgment made or brought by or for any other insured, named insured, or additional insured, as though a separate policy had been issued to each, except the insurer's liability shall not be increased beyond the amount or amounts for which the insurer would have been liable had only one insured been named.

5.5.8 CONTRACTOR shall require each of his Subcontractors to procure and maintain during the life of his subcontract, Subcontractor's Commercial General Liability and Property Damage Insurance of the type specified in subparagraphs 5.5.1, 5.5.2, 5.5.3, 5.5.4 and paragraph 5.6 hereof, in the same amounts as required by OWNER for CONTRACTOR, unless alternative amounts are approved in writing by OWNER.

5.5.9 The insurance required under subparagraphs 5.5.1, 5.5.2, 5.5.3, 5.5.4 and paragraph 5.6 hereof shall provide adequate protection for CONTRACTOR and his Subcontractors respectively against damage claims which may arise from operations under this Contract, whether such operation is by the insured or by anyone directly or indirectly employed by him, and also, against any special hazards which may be encountered in the performance of this Contract.

5.5.10 CONTRACTOR shall not commence any Work under this Contract until he has obtained all the insurance coverage required under this Article 5. and such insurance has been approved by OWNER; nor shall CONTRACTOR allow any Subcontractor to commence Work on this Contract until the insurance required by the Subcontractor has been so obtained and approved.

Property Insurance:

5.6 Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain property insurance upon the Work at the Project site to the full insurable value thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions, established by current customary construction industry standards given the type of Work in Cameron County, Texas and value thereof, or as may be required by Laws and Regulations). This insurance shall include the interests of OWNER, CONTRACTOR, and Subcontractors, in the Work, all of whom shall be listed as insured or additional insured parties, which shall insure against the perils of fire and extended coverage and shall include "all risk" insurance for physical loss and damage including theft, vandalism and malicious mischief, collapse and water damage, and such other perils as may be provided in the Supplementary Conditions (e.g. flood, wind, etc.); and shall include damages, losses and expenses arising out of or resulting from any insured loss or cost incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers, architects, attorneys and other professionals). If not covered under the "all risk" insurance or otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain similar property insurance on portions of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for Payment. The policies of insurance required to be purchased and maintained by CONTRACTOR in accordance with this paragraph shall be of an "occurrence"-type, when applicable, and contain a provision that the coverage afforded will not be canceled or materially changed until at least (30) thirty calendar days prior written notice has been given to OWNER by certified mail.

5.6.1 Property Insurance Coverage. This insurance shall protect CONTRACTOR and the additional insureds against all claims described in Section 5.6 and shall provide the following minimum amounts:

Property Insurance Coverage: Provide Full Contract Price Amount or \$100,000.00 Minimum, whichever is greater.

Waiver of Rights:

5.7 Waiver

5.7.1 CONTRACTOR waives all rights against OWNER, (unless OWNER or other named entities as additional insureds were solely negligent), for all losses and damages caused by any of the perils covered by the policies of insurance provided in response to paragraph 5.6 and any other property insurance applicable to the Work, and also waives all such rights against

all other entities named as additional insureds in such policies for losses and damages so caused. As required by paragraph 6.12, each subcontract between CONTRACTOR and a Subcontractor will contain similar “flow down” waiver provisions by the Subcontractor in favor of CONTRACTOR, OWNER, ENGINEER and their respective sub-consultants, and all other entities named as additional insureds.

5.7.2 CONTRACTOR intends that any policies provided in response to paragraph 5.6 shall protect all of the entities insured and provide primary coverage for all losses and damages caused by the perils covered thereby. Accordingly, all such policies shall contain provisions to the effect that in the event of payment of any loss or damage, the insurer will have no rights of recovery against any of the entities named as insured or additional insured, and if the insurers require separate waiver forms to be signed by any Subcontractor, CONTRACTOR will obtain the same.

Acceptance of Insurance:

5.8 If OWNER has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained by CONTRACTOR in accordance with paragraphs 5.3, 5.4, 5.5 and 5.6 on the basis of the coverages not complying with the Contract Documents, OWNER will attempt to notify CONTRACTOR in writing thereof within ten (10) calendar days of the date of delivery of such certificates to OWNER in accordance with paragraph 2.7. CONTRACTOR shall provide to the OWNER such additional information regarding the insurance provided by CONTRACTOR as the OWNER may reasonably request. Failure on the part of the OWNER or its agents to detect an insurance deficiency as compared to the insurance requirements of the Contract shall not constitute a waiver by the OWNER of the insurance requirements which CONTRACTOR and/or Subcontractor must contractually meet to be in compliance herewith.

Partial Utilization - Property Insurance:

5.9 If OWNER finds it necessary to occupy, use, or operate a portion or portions of the Work prior to Substantial Completion of all the Work, such use, occupancy or operation may be accomplished in accordance with paragraph 14.10. CONTRACTOR shall have the obligation to inform the insurers of OWNER's intent to so occupy, use or operate a portion or portions of the Work. The insurers of CONTRACTOR providing the property insurance shall consent to such use, occupancy or operation by endorsement on the policy or policies, but the property insurance shall not be canceled or lapse on account of any such partial use, occupancy, or operation by OWNER.

ARTICLE 6. CONTRACTOR'S RESPONSIBILITIES

Supervision and Superintendence:

6.1 CONTRACTOR shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents and customary construction

industry standards. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, procedures, safety and quality control of construction, but CONTRACTOR shall not be responsible for any negligence of others in any design or selection of a specific means, method, technique, sequence or procedure of construction which is indicated in and required by the Contract Documents. CONTRACTOR shall be solely responsible to guarantee that the finished Work complies accurately with the Contract Documents and CONTRACTOR shall not rely upon the OWNER's and/or ENGINEER'S construction observation to accomplish same.

6.2 CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent, who shall not be replaced without written notice to OWNER and ENGINEER, except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the site and shall have authority to act on behalf of CONTRACTOR. All communications given to the superintendent shall be as binding as if given directly to CONTRACTOR.

Labor, Materials and Equipment:

6.3 CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out the Work, oversee quality control, monitor safety, and perform construction of the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Project site. Except in connection with the safety or protection of persons or the Work or property at the Project site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the Project site shall be performed during regular daily working hours (generally eight (8) hours between 7:00 A. M. and 6:00 P.M.) as may be specifically set forth by the OWNER, and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday or any legal holiday without OWNER's advanced written consent. Preference employment shall be given to resident citizens of the Cameron County, Texas area where such persons are available and fully qualified to perform the Work to which the employment relates.

6.3.1 CONTRACTOR shall acquaint himself with all matters and conditions concerning the Project site and any existing construction. Any practical and constructive criticism or exception regarding any feature of the Work must be presented in writing to OWNER at least ten (10) calendar days prior to bidding. After the Contract Agreement to perform the Work has been signed by CONTRACTOR, it shall then be his responsibility to provide satisfactory Work that will meet the full intent of the Contract Documents. CONTRACTOR shall then pursue this Work with the other trades so that all phases of the Work may be properly coordinated without delays or damage to any parts of the Work.

6.4 Unless otherwise specified in the General Requirements, CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

6.4.1 CONTRACTOR shall provide and maintain suitable weather-tight, washable, sanitary toilet facilities for all workmen for the entire construction period. CONTRACTOR shall comply with all requirements of applicable health authorities. When toilet facilities are no longer required, promptly remove them from the Project site, disinfect and clean the surface area as required. CONTRACTOR shall keep each toilet facility swept and supplied with toilet tissue at all times.

6.5 All materials and equipment shall be of good quality and new, except as otherwise specifically provided in the Contract Documents. Sometimes a project specification may require salvage and reinstallation of OWNER's recently acquired machinery and equipment pre-existing at a project site. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment procured for the Project. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable Supplier, except as otherwise provided in the Contract Documents; but no provision of any such Supplier instructions will be effective to assign to ENGINEER any duty or authority to supervise or direct the furnishing or performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.15 or 9.16.

6.6 CONTRACTOR shall notify OWNER and ENGINEER in writing of any conflict between the manufacturer's directions and the Contract Documents and shall not perform any Work on any item until such conflict has been resolved. Upon award of the Contract, CONTRACTOR will secure a certificate of exemption from the Texas State Comptroller to preserve the OWNER's exemption from Limited Sales, Excise and Use Tax in an amount representing that part of the total Contract Price representative of the value of tangible personal property to be physically incorporated into the Project realty. The certificate of exemption must contain a statement to the effect that such materials or property have been, or will be, utilized in the performance of the Contract to the full extent of the amount for which a certificate of exemption is requested.

6.6.1 Except where otherwise specified, CONTRACTOR shall, at all times, provide protection against weather, so as to maintain all Work, materials and fixtures free from injury or damages. All new Work likely to be damaged by weather shall be covered or otherwise protected as required.

6.6.2 While it is appreciated that CONTRACTOR has to maintain continuous construction operations and sequences, it should be understood that the OWNER's electric, gas, water, wastewater production and distribution systems must function during the Contract period with a minimum of inconvenience to the OWNER's customers and the OWNER. Requirements of the: Texas Commission on Environmental Quality (TCEQ); Texas Railroad Commission (TRC); Electric Reliability Council of Texas (ERCOT); and the State and federal regulatory agencies having jurisdiction over the Project site, must be met by CONTRACTOR. It is therefore incumbent on CONTRACTOR to plan ahead on the basis of integrating his construction sequencing program as far as possible into the normal operating sequence of the various utility systems to avoid or minimize disruption of services. No departure from the normal operating sequence of the utility systems will be allowed, except with the specific advanced written agreement of OWNER.

6.6.3 CONTRACTOR shall notify OWNER and ENGINEER in writing a minimum of forty-eight (48) hours in advance of any Work which will be tied into the existing utility systems. Method of tie-in shall be submitted to ENGINEER for his approval prior to any Work being performed. At no time shall contaminated water that has not been disinfected be allowed to seep into any existing waterlines, and at no time shall sewage be allowed to flow into surrounding Project areas. Connections will be made during times of daily minimum sewage flows, if required by Project.

6.6.4 CONTRACTOR shall coordinate his Work with that of other contractors whose work may occur at a conflicting time and location. The coordination shall be such that CONTRACTOR's Work will be maintained at a normal rate. Any priority of contractors' performance disputes will be decided by OWNER, after consultation with ENGINEER.

6.6.5 All Work that is performed on, across or along International Boundary and Water Control Commission levees must conform to all I.B. & W.C.C. requirements. All Work performed on, across or along Brownsville Irrigation and Drainage District or the Cameron County Water Control and Improvement District No.16 canals or ditches must conform to all District requirements.

6.6.6 Satisfactory access or detour roads shall be provided by CONTRACTOR where necessary due to his construction.

6.6.7 If required by the Bid or Project Specifications, or by law for the type of excavation construction being performed, CONTRACTOR and his Registered Professional Engineer shall develop the Trench Safety System Plan and shall provide any necessary shoring, bracing and/or sheeting pursuant to Section 756.023 of the Texas Health and Safety Code and OSHA 29 C.F.R. 1926, Subpart P, Vol. 54 No. 209 of the Federal Register, October 31, 1989, pp. 45959-45991, and, as provided in Section 11 - "Trench Excavation and Shoring Safety Plan" of the OWNER's Standard Specifications.

6.6.8 CONTRACTOR shall routinely provide adequate barricades and warning devices in conformance with the guidelines for Traffic Control as established by the Texas Department of Transportation (TDOT) in the Texas Manual on Uniform Traffic Control Devices

(TMUTCD). This provision shall be incidental and subsidiary to the rest of the Work in this Contract, and shall not constitute a separate CONTRACTOR pay item.

6.6.9 CONTRACTOR shall provide to OWNER the services of technical representative(s) from Supplier(s) for CONTRACTOR furnished equipment, for a sufficient period of time to assist in start-up and initial adjustment of all installed or delivered equipment, and to train, advise and consult with OWNER's operating personnel, if appropriate for the Project.

6.6.9.1 For each mechanical system, CONTRACTOR shall provide to OWNER a written certification from the manufacturer's representative that the products of the manufacturer have been installed by CONTRACTOR in conformance with the manufacturer's requirements and recommendations.

6.6.10 All items of equipment required for this Contract shall be Bid to provide as part of the Contract Price, any literature explaining "Operation and Maintenance" (O&M) of that item of equipment. If a manufacturer does not print such a standard O&M manual, CONTRACTOR shall develop and provide OWNER with a customized manual approved in writing by the manufacturer.

Adjusting Progress Schedule:

6.7 CONTRACTOR shall submit to ENGINEER for the Project record and acceptance only, and not approval or concurrence to the extent indicated in paragraph 2.9, periodic adjustments in the Progress Schedule to reflect the impact thereon of new Project developments; these revised Schedules will conform generally to the Progress Schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

Substitutes or "Or-Equal" Items:

6.8

6.8.1 As a general rule, the OWNER and ENGINEER prefer all determinations regarding proposed Substitutions of materials or equipment as potential "or-equal-items" be resolved during the pre-Bid phase. Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item, or the name of a particular Supplier, the naming of the item is intended to establish the type, function, performance standard and quality required. In some instances, the OWNER, after consultation with ENGINEER, is legally allowed to "sole source" a specific material or component of equipment when its design and/or performance is required to integrate with a larger OWNER system that will remain in place, or that OWNER has an inventory of spare parts for, or that OWNER has a long favorable, performance reliability history with. Unless the material or equipment name is followed by words indicating that no substitution is permitted, materials or equipment of other Suppliers generally may be accepted by ENGINEER, if sufficient information is submitted by CONTRACTOR to allow ENGINEER to determine that the material or equipment proposed is equivalent, or equal to, that named by ENGINEER. The procedure for review by ENGINEER will include the following as supplemented in the General Requirements. Requests for review of substitute items of material

and equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall make written application to ENGINEER for acceptance thereof, certifying in writing that the proposed substitute will adequately perform the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The CONTRACTOR'S written application will state that the evaluation and acceptance of the proposed substitute will not prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for any other work on the Project by other contractors) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any vendor license fee or royalty. All variations of the proposed substitute from that specified will be identified in the CONTRACTOR'S written application and available maintenance, repair and replacement parts and service will be indicated. The CONTRACTOR'S written application will also contain an itemized estimate of all costs or savings that will result directly or indirectly from acceptance of such substitute, including costs of redesign, operation, performance, and potential claims or protests of other contractors affected by any resulting change, all of which shall be considered by ENGINEER in evaluating the proposed substitute. ENGINEER may require CONTRACTOR to furnish at CONTRACTOR's non-compensable expense additional data about the proposed substitute.

6.8.2 If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, CONTRACTOR may generally furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to ENGINEER, if CONTRACTOR submits sufficient written information to allow ENGINEER to determine that the substitute proposed can be legally utilized by CONTRACTOR (e.g. patented or licensed processes) and is equivalent to that indicated or required by the Contract Documents. OWNER may have similar legal rights to "sole source" as generally indicated above in paragraph 6.8.1. The procedure for review by ENGINEER will be similar to that provided in paragraph 6.8.1 above, as applied by ENGINEER and as may be supplemented in the General Requirements.

6.8.3 ENGINEER will be allowed a reasonable time within which to evaluate each proposed substitute. ENGINEER will be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without ENGINEER's prior written acceptance which will be evidenced by either a Change Order or an approved Shop Drawing. OWNER may require CONTRACTOR to furnish at CONTRACTOR's non-compensable expense, a special performance guaranty bond or other form of surety with respect to any accepted substitute. ENGINEER will record time required by ENGINEER and any ENGINEER's outside technical consultants in evaluating substitutions proposed by CONTRACTOR and in making any required changes in the Contract Documents occasioned thereby. Whether or not ENGINEER accepts a proposed substitute, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and any ENGINEER's consultants for evaluating each proposed substitute.

Concerning Subcontractors, Suppliers and Others:

6.9

6.9.1 CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization (including those acceptable to OWNER and ENGINEER as indicated in paragraph 6.8), whether initially or as a substitute, against whom OWNER or ENGINEER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

6.9.2 The Pre-Bid documents require the CONTRACTOR to identify Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of material and equipment), to be submitted to OWNER at the time of bidding. OWNER's or ENGINEER's acceptance (either in writing or by failing to make written objection thereto) of any such Subcontractor, Supplier or other person or organization so identified by CONTRACTOR may be revoked by OWNER or ENGINEER on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable substitute. The Contract Price may be increased by the difference in the cost occasioned by such substitution and an appropriate Change Order or written Amendment may be executed by the OWNER and CONTRACTOR. All increases or decreases in the Contract Price shall be governed by all State and local statutes, codes, laws, ordinances, rules and regulations governing public competitive bidding and maximum Change Order limits. No acceptance by OWNER or ENGINEER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of OWNER or ENGINEER to reject any defective or non-compliant Work.

6.10 CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and/or omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct contract or indirect relationship with CONTRACTOR, just as CONTRACTOR is responsible to the OWNER for CONTRACTOR's own acts and/or omissions. Nothing in the Contract Documents shall create any contractual relationship between OWNER or ENGINEER and any such Subcontractor, subtier subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of OWNER to pay or to supervise the payment of any moneys due any such Subcontractor, subtier subcontractor, Supplier or other person or organization, except as may otherwise be required by Laws and Regulations.

6.11 The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

6.12 All Work performed for CONTRACTOR by a Subcontractor will be pursuant to an appropriate written agreement between CONTRACTOR and the Subcontractor, which specifically binds the Subcontractor through appropriate "flow down" provisions, to the applicable terms and conditions of the Contract Documents for the benefit of OWNER, and contains waiver provisions as required by paragraph 5.7.

Patent Fees and Royalties:

6.13 CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device, which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work, and if to the actual knowledge of OWNER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. **CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS THE CITY OF BROWNSVILLE AND THE BROWNSVILLE PUBLIC UTILITIES BOARD, INCLUDING THEIR RESPECTIVE COMMISSIONERS, BOARD MEMBERS OFFICERS AND EMPLOYEES (INDEMNITEES) AGAINST ANY CLAIMS, DAMAGES, LOSSES AND EXPENSES (INCLUDING ATTORNEYS' FEES AND COURT COSTS) ARISING OUT OF ANY INFRINGEMENT OF PATENT RIGHTS OR COPYRIGHTS INCIDENT TO THE USE IN THE PERFORMANCE OF THE WORK OR RESULTING FROM THE INCORPORATION IN THE WORK OF ANY INVENTION, DESIGN, PROCESS, PRODUCT OR DEVICE NOT SPECIFIED IN THE CONTRACT DOCUMENTS, AND SHALL DEFEND ALL SUCH CLAIMS IN CONNECTION WITH ANY ALLEGED INFRINGEMENT OF SUCH RIGHTS. IT IS THE EXPRESSED INTENTION OF THE PARTIES HERETO THAT THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH IS INDEMNITY BY CONTRACTOR TO INDEMNIFY AND PROTECT INDEMNITEES FROM THE CONSEQUENCES OF OWNER'S OWN NEGLIGENCE WHERE THAT NEGLIGENCE ON THE PART OF THE OWNER IS A CONCURRING CAUSE OF THE CLAIMS, DAMAGES, LOSSES, AND EXPENSES REFERENCED ABOVE. FURTHERMORE, THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH SHALL HAVE NO APPLICATION TO ANY CLAIM, DAMAGE, LOSS AND EXPENSE REFERENCED ABOVE WHERE SUCH RESULTS FROM THE SOLE NEGLIGENCE OF THE OWNER INDEPENDENT OF THE FAULT OF ANY OTHER PERSON OR ENTITY.**

Permits:

6.14 Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids. CONTRACTOR shall pay all charges of utility owners with the exception of those normally charged by OWNER, for connections to the Work, and OWNER shall pay all charges of such third-party utility owners for facility capital costs related thereto such as impact fees or plant investment fees, if any.

6.14.1 Fires shall not be built on the Project premises except by the express consent of OWNER and Brownsville City and/or County Fire Marshall.

Laws and Regulations:

6.15

6.15.1 CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to furnishing and performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, OWNER shall not be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

6.15.2 If CONTRACTOR has actual knowledge that the Specifications or Drawings are at variance with any Laws or Regulations, CONTRACTOR shall give ENGINEER prompt written notice thereof, and any necessary changes will be authorized by OWNER by one of the methods indicated in paragraph 3.4. If CONTRACTOR performs any Work knowing, or having reason to know, that it is contrary to such Laws or Regulations, and without such advanced written notice to ENGINEER, CONTRACTOR shall bear all costs arising therefrom; however, it shall not be CONTRACTOR's original and primary responsibility to make certain that the Specifications and Drawings are in accordance with such Laws and Regulations.

Taxes:

6.16 "Pursuant to 34 Texas Administrative Code 3.291, in order for the OWNER to continue to benefit from its status as a State Sales and Use Tax Exempt Organization, after August 14, 1991 public works construction contracts must be awarded on a "separated contract" basis. A "separated contract" is one where the CONTRACTOR distinguishes in writing prior to starting Work, between the value of the tangible personal property (materials such as pipe, bricks, lumber, concrete, paint, etc.) to be physically incorporated into the Project real estate from the total Contract price. Under the "separated contract" format, the CONTRACTOR in effect becomes a "seller" to the OWNER of materials that are to be physically incorporated into the Project real estate. As a "seller", the CONTRACTOR will issue a "Texas Certificate of Resale" to the CONTRACTOR'S supplier in lieu of paying the sales tax on the Project materials at the time of purchase. The CONTRACTOR will also issue a "Certificate of Exemption" to the supplier, demonstrating that the personal property is being purchased for resale and that the resale is to a public owner, the City of Brownsville, Texas, and its BPUB, which are sales tax exempt entities under UTCA Tax Code Section 151.309(5). CONTRACTOR should be careful to consult the most recent guidelines of the Texas State Comptroller of Public Accounts regarding the sales tax status of supplies and equipment that are used and consumed during Project Work (e.g. gas, oil, fluids, rental equipment, etc.), but that are not physically incorporated into the Project real estate. Such items are generally not tax exempt. If the CONTRACTOR has questions about the implementation of this policy he is asked to inquire with the State Comptroller of Public Accounts, Tax Administration Division, State of Texas, Austin, Texas 78774. The CONTRACTOR will not include any federal taxes in Bid prices since the OWNER is exempt from payment of such taxes. "Texas Certificates of Exemption", "Texas Certificates of Resale" and "Texas Sales Tax Permits" are forms available to the CONTRACTOR through the regional offices of the Texas State Comptroller of Public Accounts."

6.16.1. On the last page of the Construction Agreement a blank is provided for the CONTRACTOR to fill in an amount in dollars and cents indicating the Bid price of all materials and other tangible personal property included in the total Bid that will be physically incorporated into the Project real estate. The amount to be filled in by CONTRACTOR has reference to all of such materials and other tangible personal property as will actually be physically incorporated into the final result of the Work covered by the Contract. "Tangible personal property" means personal property which may be seen, weighed, measured, felt or touched, or which is in any other manner perceptible to the senses.

6.16.2. Upon award of the Contract, OWNER will, on written request of CONTRACTOR, furnish CONTRACTOR with a certificate of exemption from the Texas Limited Sales, Excise and Use Tax in only an amount not exceeding the above mentioned bid price for materials and other tangible personal property that will be physically incorporated into the Project real estate. Such written request by CONTRACTOR must contain a statement to the effect that such materials or property will be utilized in the performance of the Contract, to the full extent of the amount for which a certificate of exemption is requested. The Texas Comptroller of Public Accounts often audits contractors regarding compliance with these paragraph 6.16 provisions.

Use of Premises:

6.17 CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the Project site and land and areas identified in and permitted by the Contract Documents, or otherwise privately acquired by the CONTRACTOR, and other land and areas permitted by Laws and Regulations, rights-of-way, permits and easements. CONTRACTOR shall assume full responsibility for any damage to any Project land or area, and to the owner or occupant of any land or areas contiguous thereto, resulting from the performance of the Work. Should any claim be made against OWNER by any such adjacent owner or occupant because of the performance of the Work, CONTRACTOR shall promptly attempt to settle with such other party by agreement, or otherwise resolve the claim by mediation, arbitration or at law. **CONTRACTOR SHALL INDEMNIFY, AND HOLD HARMLESS THE CITY OF BROWNSVILLE AND THE BPUB INCLUDING THEIR RESPECTIVE COMMISSIONERS, BOARD MEMBERS OFFICER'S AND EMPLOYEES (INDEMNITEES) FROM AND AGAINST ALL CLAIMS, DAMAGES, LOSSES AND EXPENSES (INCLUDING, BUT NOT LIMITED TO, FEES OF ENGINEERS, ARCHITECTS, ATTORNEYS AND OTHER PROFESSIONALS AND COURT COSTS) ARISING DIRECTLY, INDIRECTLY OR CONSEQUENTIALLY OUT OF ANY ACTION, LEGAL OR EQUITABLE, BROUGHT BY ANY SUCH OTHER THIRD PARTY ENTITY AGAINST OWNER, TO THE EXTENT BASED ON A CLAIM ARISING OUT OF CONTRACTOR'S NEGLIGENT PERFORMANCE OF THE WORK. IT IS THE EXPRESSED INTENT OF THE PARTIES HERETO THAT THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH IS INDEMNITY BY CONTRACTOR TO INDEMNIFY AND PROTECT THE INDEMNITEES FROM THE CONSEQUENCES OF THE INDEMNITEES' OWN NEGLIGENCE, WHEN THAT NEGLIGENCE ON THE**

PART OF THE INDEMNITEES IS A CONCURRING CAUSE OF THE INJURY, DEATH OR DAMAGE.

FURTHERMORE, THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH SHALL HAVE NO APPLICATION TO ANY CLAIM, LOSS, DAMAGE, CAUSE OF ACTION, SUIT, AND LIABILITY WHERE THE INJURY, DEATH OR DAMAGE RESULTS FROM THE SOLE NEGLIGENCE OF THE INDEMNITEES, INDEPENDENT OF THE FAULT OF ANY OTHER PERSON OR ENTITY.

6.18 During the progress of the Work, CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work, CONTRACTOR shall remove and legally dispose of all waste materials, rubbish and debris from and about the premises, as well as all tools, appliances, construction equipment and machinery, and surplus materials, and shall leave the Project site clean and ready for occupancy by OWNER. CONTRACTOR shall restore to original condition all property not designated for alteration by the Contract Documents.

6.19 CONTRACTOR shall be confined to all working real estate and easements provided by OWNER, unless CONTRACTOR separately and privately secures at his own non-reimbursable cost, additional private temporary construction easements. Generally, storage of excavation material and all CONTRACTOR equipment and material shall remain within the limits of Project and working easements.

6.20 CONTRACTOR shall not weight load or permit any part of any structure or utility to be loaded in any manner that will endanger the structure or utility, nor shall CONTRACTOR subject any part of the Work or adjacent property to surcharge stresses or pressures, or loss of subjacent or lateral support, that will endanger it.

Record Documents:

6.21 CONTRACTOR shall as a precondition to interim monthly progress payments, show evidence of regularly maintaining and updating and storing in a safe place at the Project site, one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Directive Changes, Field Orders and any written interpretations and clarifications (issued pursuant to paragraph 9.4) in good order and periodically annotated to show all changes made by CONTRACTOR during construction. These periodically updated record documents, together with all approved samples and a counterpart of all approved Shop Drawings, will be at all times available to ENGINEER for on-site reference. Upon completion of the Work, these record documents, samples and Shop Drawings, will be delivered to ENGINEER for OWNER record retention.

Safety and Protection:

6.22 CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR

shall take all necessary precautions for the safety of employees and the general public, and shall also provide the necessary protection to prevent damage, injury or loss to:

6.22.1 other persons and organizations who may be required to properly visit the Project site;

6.22.2 all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Project site; and

6.22.3 other property at the Project site or adjacent thereto, including drainage gradients, trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and Underground Facilities not designated for removal, relocation or replacement in the course of construction.

6.22.4 Driveways, culverts, storm sewer inlets and laterals, and other public or private property that is destroyed or removed during the construction shall be replaced to its original or better condition by CONTRACTOR. Temporary drainage and any subgrade dewatering is to be provided by CONTRACTOR in the total Contract Price as necessary to protect and complete the Work.

6.22.5 CONTRACTOR is responsible for locating any underground obstacles. It is not represented by OWNER or ENGINEER that the Plans show all previous or current sewers, waterlines, electric lines, gas lines, telephone lines and other underground obstacles and utilities. CONTRACTOR shall exercise caution to prevent damage to existing utilities and other obstacles or facilities not meant for demolition or construction modifications during the progress of the construction Work, taking care to locate same in advance of the actual Work. OWNER or ENGINEER will render reasonable assistance to CONTRACTOR in the matter of determining the location of existing utilities by making available such existing maps, records, and other available existing information as may be accessible to OWNER or ENGINEER, when requested to do so, but the accuracy of such information will not be guaranteed by OWNER or ENGINEER. CONTRACTOR shall make repairs and/or replacements to all damage to existing utilities resulting from his operations. Where a pipe, duct or other structure of a utility is exposed, which, in the opinion of ENGINEER requires strengthening, altering, shielding or moving, if that utility owner does not cure the situation itself, CONTRACTOR shall perform such Work on same as ENGINEER may order in writing after consultation by ENGINEER with the affected utility owner, that Work, if any, may be paid for by OWNER as extra Work. Should CONTRACTOR, in the layout of his Work, encounter any pipe, underground utility or structure, the location of which has not been furnished to him by ENGINEER, he shall bring such conditions to the attention of ENGINEER for ENGINEER, OWNER and CONTRACTOR discussion to determine the CONTRACTOR'S method to be used to pin in place, remove or bypass such obstructions.

6.22.6 It is essential that in the event of any CONTRACTOR damage being caused to existing utilities, that immediate attention be given to their repair. Any repair work carried out shall be at the non-reimbursable cost of CONTRACTOR and shall be performed to the complete satisfaction of ENGINEER and OWNER, who will acknowledge same in writing. It is therefore, the duty of CONTRACTOR, prior to Bid submittal if possible, and no later than the commencement of construction, to inspect and accurately record in writing to OWNER and

ENGINEER, the pre-existing condition of any utility which he reasonably suspects or knows to be damaged, faulty, or defective. In addition, any such utilities so recorded, which in the opinion of CONTRACTOR may deteriorate further as a result of the proposed mode of construction operations should be protected. CONTRACTOR shall discuss with OWNER and ENGINEER what appropriate remedial measures should be employed by CONTRACTOR or utility owner to reach a resolution.

CONTRACTOR shall comply with all applicable Laws and Regulations of any public body having jurisdiction for the safety of persons or property, or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and utility owners, the scheduling and location(s), that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, restoration and replacement of their property. All damage, injury or loss to any property referred to in paragraphs 6.22.3 and 6.22.4 caused, directly or indirectly, in whole or in part by CONTRACTOR, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work; or anyone for whose acts any of them may be liable; shall be remedied by CONTRACTOR. CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.13 that the Work is acceptable to ENGINEER (except as otherwise expressly provided in connection with Substantial Completion).

6.23 CONTRACTOR shall designate in writing to OWNER a responsible representative at the Project site whose duty shall be the management of risk and safety, and that person shall make a concerted effort to assist workers and visitors at the Project site to prevent accidents. This person shall be CONTRACTOR's superintendent, unless otherwise designated in writing by CONTRACTOR to OWNER.

Emergencies:

6.24 In emergencies affecting the safety or protection of persons, or the Work, or property at the Project site or adjacent thereto, CONTRACTOR, without special written or oral instruction or authorization from ENGINEER or OWNER, is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If ENGINEER determines that a change in the Work or Contract Documents is recommended because of the CONTRACTOR's prompt action taken in response to an emergency, a Work Directive Change or Change Order may be issued by OWNER to document the consequences of any changes or variations.

Shop Drawings and Samples:

6.25 After checking and verifying all field measurements and after complying with applicable procedures specified in the General Requirements, CONTRACTOR shall submit to ENGINEER for review and approval, in accordance with the accepted Schedule of Shop Drawing

submissions (see process in paragraphs 2.6 and 2.9), or for other appropriate action if so indicated in the Supplementary Conditions, a copy of all Shop Drawings, to ENGINEER, which will bear a stamp or specific written indication by ENGINEER that CONTRACTOR has satisfied CONTRACTOR's submission review responsibilities under the Contract Documents. All submissions will be identified as the ENGINEER may require. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable ENGINEER to efficiently and comprehensively review the CONTRACTOR's information as required.

6.25.1 Before ordering any material or doing any Work, CONTRACTOR will verify all measurements of any existing and new Work and shall be responsible for their correctness. Any differences which may be found shall be submitted to ENGINEER for consideration before proceeding with the Work. No extra compensation will be allowed to CONTRACTOR because of differences between actual dimensions and measurements indicated on the Drawings.

6.26 CONTRACTOR shall also submit to ENGINEER for review and approval with such promptness as to cause no delay in Work, all samples required by the Contract Documents. All samples will have been checked by and accompanied by a specific written indication that CONTRACTOR has internally satisfied CONTRACTOR's submission review responsibilities under the Contract Documents and will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which the material is intended.

6.27

6.27.1 Before submission of each Shop Drawing or sample, CONTRACTOR shall have internally determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar data with respect thereto and reviewed or coordinated each Shop Drawing or sample with other Shop Drawings and samples, and with the requirements of the Work and the Contract Documents.

6.27.2 At the time of each submission, CONTRACTOR shall give ENGINEER specific written notice of each variation that the Shop Drawings or samples may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation to be made on each Shop Drawing submitted to ENGINEER for review and approval, of each such CONTRACTOR variation.

6.28 ENGINEER will review and approve with reasonable promptness, Shop Drawings and samples, but ENGINEER's review and approval will be only for general conformance with the design concept of the Project and for compliance with the information given in the Contract Documents, and shall not extend to CONTRACTOR's means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents), or to CONTRACTOR's safety precautions or programs incident thereto. The review and approval of a separate or component item will not indicate approval of the assembly into which the item integrally functions. CONTRACTOR shall make corrections required by ENGINEER,

and shall return the required number of corrected copies of Shop Drawings and submit as required, new samples for review and approval. CONTRACTOR shall direct ENGINEER's specific attention in writing to the most current revisions, other than the corrections called for by ENGINEER on previous CONTRACTOR submittals.

6.29 ENGINEER's review and approval of Shop Drawings or samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents, unless CONTRACTOR has in writing called ENGINEER's specific attention to each such variation at the time of submission as required by paragraph 6.27.2, and ENGINEER has given written approval of each such variation by a specific written notation thereof incorporated in or accompanying the Shop Drawing or sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for CONTRACTOR's errors or omissions in the Shop Drawings, or from responsibility for having complied with the provisions of paragraph 6.27.1.

6.30 Where a Shop Drawing or sample is required by the Specifications, any related Work performed prior to ENGINEER'S review and approval of the pertinent submission will be at the sole risk, and non-reimbursable expense and responsibility of CONTRACTOR.

Continuing the Work:

6.31 CONTRACTOR shall carry on the Work and adhere to the Progress Schedule during any and all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as OWNER may otherwise agree to in writing.

INDEMNIFICATION:

6.32 CONTRACTOR AGREES TO AND SHALL INDEMNIFY AND HOLD HARMLESS THE CITY OF BROWNSVILLE AND THE BROWNSVILLE PUBLIC UTILITIES BOARD, INCLUDING THEIR RESPECTIVE COMMISSIONERS, BOARD MEMBERS, OFFICERS, AND EMPLOYEES (INDEMNITEES) FROM AND AGAINST ANY AND ALL CLAIMS, LOSSES, DAMAGES, CAUSES OF ACTION, SUITS, AND LIABILITY OF EVERY KIND, INCLUDING ALL EXPENSES OF LITIGATION, COURT COSTS, AND ATTORNEY'S FEES, FOR INJURY TO OR DEATH OF ANY PERSON, OR FOR DAMAGE TO ANY PROPERTY, ARISING OUT OR IN CONNECTION WITH THE NEGLIGENT PERFORMANCE OF THE WORK, PROVIDED THAT SUCH CLAIM, DAMAGE, LOSS, LIABILITY OR EXPENSE: (A) IS ATTRIBUTABLE TO BODILY INJURY, SICKNESS, DISEASE OR DEATH OR TO INJURY OR DESTRUCTION OF TANGIBLE PROPERTY, INCLUDING THE LOSS OF USE RESULTING THEREFROM; AND (B) IS CAUSED IN WHOLE OR IN PART BY ANY CONDITION OF THE WORK OR MATERIALS, OR BY ANY NEGLIGENT ACT OR OMISSION OF CONTRACTOR, ANY SUBTIER SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY CONTRACTOR OR ANY SUBCONTRACTOR OR ANYONE FOR WHOSE ACTS CONTRACTOR OR ANY SUBCONTRACTOR MAY BE LIABLE UNDER THIS CONTRACT.

SUCH INDEMNITY SHALL APPLY WHERE THE CLAIMS, LOSSES, DAMAGES, CAUSES OF ACTION, SUITS, OR LIABILITY ARISE IN PART FROM THE CONCURRENT NEGLIGENCE OF INDEMNITEES.

IT IS THE EXPRESSED INTENTION OF THE PARTIES HERETO, BOTH CONTRACTOR AND INDEMNITEES THAT THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH IS INDEMNITY BY THE CONTRACTOR, TO INDEMNIFY AND PROTECT INDEMNITEES FROM THE CONSEQUENCES OF INDEMNITEE'S OWN NEGLIGENCE, WHERE THAT NEGLIGENCE IS A CONCURRING CAUSE OF THE INJURY, DEATH OR DAMAGE. FURTHERMORE, HOWEVER, THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH SHALL HAVE NO APPLICATION TO ANY CLAIM, LOSS, DAMAGE, CAUSE OF ACTION, SUIT, AND LIABILITY WHERE THE INJURY OR DEATH OR DAMAGE RESULTS FROM THE SOLE NEGLIGENCE OF THE INDEMNITEES, INDEPENDENT OF THE FAULT OF ANY OTHER PERSON OR ENTITY.

6.33 IN ANY AND ALL CLAIMS AGAINST INDEMNITEES OR ANY OF THEIR CONSULTANTS, AGENTS OR EMPLOYEES BY ANY EMPLOYEE OF CONTRACTOR, ANY SUBCONTRACTOR, ANY PERSON OR ORGANIZATION DIRECTLY OR INDIRECTLY EMPLOYED BY ANY OF THEM TO PERFORM OR FURNISH ANY OF THE WORK, OR ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE, THE INDEMNIFICATION OBLIGATION UNDER PARAGRAPH 6.32 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, OR ANY SUCH SUBCONTRACTOR, OR OTHER PERSON OR ORGANIZATION UNDER WORKERS' OR WORKMEN'S COMPENSATION ACTS, DISABILITY BENEFIT ACTS OR OTHER EMPLOYEE BENEFIT ACTS.

6.34 THE OBLIGATIONS OF CONTRACTOR UNDER PARAGRAPH 6.32 SHALL NOT EXTEND TO ANY LIABILITY OF ENGINEER ARISING OUT OF THE PREPARATION OR APPROVAL OF PROJECT MAPS, DRAWINGS, DESIGNS, PLANS, SPECIFICATIONS, OPINIONS, CALCULATIONS, REPORTS, AND SURVEYS.,

6.35 CONTRACTOR shall perform all phases of Work, other than general clean-up, through the duration of the Contract, as defined in these General and any Supplementary Conditions. If CONTRACTOR desires to perform Work, other than general clean-up, during weekends or holidays, prior proper arrangements must be made in writing with OWNER, or any other regulatory agency regarding such Work.

6.35.1 General. This Contract shall be based upon payment by CONTRACTOR and his Subcontractors of wage rates not less than the General Prevailing Wage Rate of per diem wages for work of a similar character in Cameron County, Texas, for each type of laborer, workman or mechanic needed to implement the Contract at the Project Site, and not less than the general prevailing rate of per diem wages for legal holiday and overtime Work. The Schedule of General Prevailing Wage Rates specifically adopted by the OWNER for this Project, and other

important Wage and Labor Standard Provisions are included in these Contract Documents in the Supplementary Conditions. Pursuant to local OWNER labor policy, no Project worker shall be paid less than \$8.00 per hour, regardless of the adopted wage listings in the attached U. S. Department of Labor General Wage Decision for Cameron County, Texas.

CONTRACTOR shall at minimum comply with all requirements of the prevailing wage law of the State of Texas, Texas Revised Civil Statutes, Texas Government Code (TGC) Section 2259.001 et seq., including the latest amendments thereto, and those special local wage provisions adopted by OWNER. When in conflict, the more stringent requirements apply to CONTRACTOR.

6.35.2 Records. CONTRACTOR and each Subcontractor shall keep an accurate record showing the names and occupations of all classifications of laborers, workmen, and mechanics employed, together with the actual wages paid to each worker. At all reasonable working hours, such CONTRACTOR records shall be open to inspection by the representatives of the OWNER. With each monthly application for payment, CONTRACTOR shall provide to ENGINEER a certified copy of such payroll records as necessary to substantiate compliance with this provision during the period of time for which the application for payment pertains. OWNER shall take cognizance of any and all employee complaints regarding any violations of the requirements of TGC Section 2259.001 et seq.

6.35.3 Penalty. In case CONTRACTOR and any Subcontractor fail to comply with the prevailing wage law, by statutory authority, CONTRACTOR shall forfeit to the OWNER \$60.00 per calendar day, or portion thereof, for each laborer, workman, or mechanic who is paid less than the specified local rate for any Work done under the Contract.

6.35.4 Hours of Labor. CONTRACTOR shall comply with all requirements of the hours of work on public works in accordance with the laws of the State of Texas, Texas Revised Civil Statutes, Articles 5165.1 to 5165.3, including the latest amendments thereto.

No CONTRACTOR or Subcontractor contracting for any part of the Contract Work which may require or involve the employment of laborers, workmen or mechanics at the Project Site, shall require or permit any laborer, workman or mechanic in any work week in which he is employed on such Work, to work in excess of forty (40) hours in such work week, unless such laborer, workman or mechanic receives compensation at a rate not less than one and one-half times his basic rate of pay, for all hours in excess of forty (40) hours in such work week.

6.35.5 Equal Employment Opportunities. The CONTRACTOR shall not discriminate against any employee or applicant for employment because of race, religion, gender, sexual preference, national origin, age, physically challenged condition, or a political belief or affiliation, and will comply with all State and federal statutes applicable to CONTRACTOR which relate to employment discrimination.

6.35.6 Veterans Preference. Pursuant to Texas Revised Civil Statutes, Article 4413(31), including the latest amendments thereto, CONTRACTOR shall give preference in employment to honorably discharged veterans who were engaged in the military services of the

United States in time of war or conflict and who are, and have been, citizens of Texas for not less than five (5) years.

ARTICLE 7. OTHER WORK

Related Work at Site:

7.1 OWNER may perform other separate work related to the Project at the site by OWNER's own forces, have other work performed by utility owners, or award other direct construction contracts therefor, which shall contain General Conditions similar to these. If the fact that such other work is to be performed was **not** originally noted in these Contract Documents, advance written notice thereof will be given to CONTRACTOR prior to OWNER authorizing any such other work; and, if CONTRACTOR believes that such other work performance will involve additional expense to CONTRACTOR, or requires additional time, and the Parties hereto are unable to agree as to the extent thereof, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12. All increases or decreases in the Contract Price shall be governed by all State and local laws, statutes, codes, ordinances, rules and regulations governing public competitive bidding and Change Orders.

7.2 CONTRACTOR shall afford each utility owner and other contractor who is a party to a separate direct contract with OWNER (or OWNER, if OWNER itself is performing the additional work with OWNER's employees) proper and safe access to the Project site and a reasonable opportunity for the introduction and storage of materials and equipment, and the execution of such separate work, and shall properly connect and coordinate the Work with their separate work. CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. CONTRACTOR shall not endanger any separate work of others by cutting, excavating or otherwise altering their work, and will only cut or alter their work with the written consent of ENGINEER and the consent of other contractor(s), persons whose separate work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of such utility owners and other contractors, to the extent that there are comparable provisions for the benefit of CONTRACTOR in said separate direct contracts between OWNER and such other utility owners and other contractors.

7.3 If any part of CONTRACTOR's Work depends upon the separate work of any such other contractor or utility owner (or OWNER) for proper execution or results, CONTRACTOR shall inspect and promptly report to ENGINEER in writing any delays, defects or deficiencies in such other work that renders it unavailable or unsuitable for such integration, proper execution and results of CONTRACTOR'S Work. CONTRACTOR's failure to so report will constitute an acceptance of the other separate work as fit and proper for integration with CONTRACTOR's Work, except for latent or non-apparent defects and deficiencies in the other work.

Coordination:

7.4 If OWNER contracts with others for the performance of other separate work on the Project at the Project site, the person or organization who will have authority and responsibility

for coordination of the activities among the various prime contractors will be identified by OWNER in the Supplementary Conditions, or OWNER'S WORK DIRECTIVE CHANGE, and the specific matters to be covered by such authority and responsibility will be itemized, and the extent of such authority and responsibilities will be provided, in the Supplementary Conditions or OWNER'S WORK DIRECTIVE CHANGE.

ARTICLE 8. OWNER'S RESPONSIBILITIES

8.1 OWNER shall issue all written and oral communications to CONTRACTOR through OWNER's Field Representative and/or ENGINEER.

8.2 In case of termination of the employment of ENGINEER, OWNER shall appoint a replacement Engineer whose status under the Contract Documents shall be that of the former ENGINEER.

8.3 OWNER shall furnish the data required of OWNER under the Contract Documents promptly, and shall make eligible payments to CONTRACTOR within the time periods allowed by the Contract Documents and State prompt pay statutes, after payments are due as provided in Article 14.

8.4 OWNER's duties in respect to providing lands and easements and providing any recent existing available engineering surveys to establish CONTRACTOR construction reference points are set forth in paragraphs 4.1 and 4.4. Paragraph 4.2 refers to OWNER's identifying and making available to CONTRACTOR copies of any existing and available reports of explorations and tests of subsurface pre-existing conditions at the Project site which are not part of the Contract Documents, but which have been utilized by ENGINEER in generally preparing the Drawings and Specifications.

8.5 OWNER is obligated to consider and may execute Change Orders as indicated in paragraph 10.4.

8.6 OWNER's responsibility in respect to certain inspections, tests and approvals is set forth in paragraphs 13.3 through 13.5.

8.7 In connection with OWNER's right to stop Work or suspend Work, see paragraphs 13.10 and 15.1. Paragraph 15.2 outlines OWNER's right to terminate services of CONTRACTOR under certain circumstances.

ARTICLE 9. ENGINEER'S STATUS DURING CONSTRUCTION

Owner's Representative:

9.1 OWNER's private consulting ENGINEER (generally through its Resident Project Representative) will be OWNER's primary representative during the construction period. OWNER's Field Representative will be the secondary representative during the construction period.

Visits to Site:

9.2 ENGINEER, routinely through the Resident Project Representative will make periodic visits to the site at intervals appropriate to the various stages of construction to observe the progress and general quality of the executed Work and to determine, in general, for the benefit of OWNER only, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous on-site observations to check the quality or quantity of the Work, because CONTRACTOR is solely responsible for same. ENGINEER's efforts will be directed toward providing for OWNER only, a greater degree of confidence that the CONTRACTOR's completed Work will conform to the Contract Documents. On the basis of such limited visits and on-site observations as an experienced and qualified design professional, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to advise OWNER of any obvious defects and deficiencies in the Work.

On-Site Project Representation:

9.3 OWNER will generally furnish a Project Field Representative to assist ENGINEER in observing the daily performance of the Work for the sole benefit of the OWNER. This is an option available to OWNER that need not be exercised, nor may it be relied upon by the CONTRACTOR in any way to satisfy CONTRACTOR's quality control responsibility. The secondary duties, responsibilities and limitations of authority of any such OWNER Field Representative and any assistants will be determined by the OWNER.

Clarifications and Interpretations:

9.4 ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as ENGINEER may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. If CONTRACTOR believes that a written clarification or interpretation by ENGINEER justifies an increase in the Contract Price or an extension of the Contract Time, and the OWNER and CONTRACTOR are unable to agree to the basis, amount or extent thereof, CONTRACTOR may make a claim therefore as provided in Article 11 or Article 12. Any increases or decreases in the Contract Price shall be governed by all State and local laws, statutes, codes, ordinances, rules and regulations governing public competitive bidding and Change Orders.

Authorized Variations in Work:

9.5 ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Time, and are consistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER, and also on CONTRACTOR who shall promptly perform the Work involved. If CONTRACTOR believes that a Field Order justifies an increase in the Contract Price or an extension of the Contract Time, CONTRACTOR may make

a claim therefore as provided in Article 11 or 12. Any increases or decreases in the Contract Price shall be governed by all State and local laws, statutes, codes, ordinances, rules and regulations governing public competitive bidding and Change Orders.

Rejecting Defective Work:

9.6 ENGINEER will have the authority to disapprove or reject Work which ENGINEER believes to be defective, and will also have authority to require special inspection or testing of the Work as provided in paragraph 13.9, whether or not the Work is fabricated, installed or completed.

Shop Drawings, Change Orders and Payments:

9.7 In connection with ENGINEER's responsibility for Shop Drawings and samples, see paragraphs 6.25 through 6.30 inclusive.

9.8 In connection with ENGINEER's responsibilities as to Change Orders, see Articles 10, 11 and 12.

9.9 In connection with ENGINEER's responsibilities in respect to Applications for Payment, etc., see Article 14.

Determinations for Unit Prices:

9.10 ENGINEER will determine the final actual quantities and classifications of any Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR, ENGINEER's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). ENGINEER's written decisions thereon will be final and binding upon OWNER and CONTRACTOR.

Decisions on Disputes:

9.11 ENGINEER will be the interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work, and claims under Articles 11 and 12 in respect of changes in the Contract Price or Contract Time, will be referred initially to ENGINEER in writing, with a request for a formal decision in accordance with this paragraph, which ENGINEER will render in writing within a reasonable time. Written notice of each such claim, dispute and other matter will be delivered by the claimant (OWNER or CONTRACTOR) to ENGINEER and opposing Party no later than thirty (30) calendar days after the occurrence of the event giving rise thereto, and written supporting data will be submitted to ENGINEER and the other Party within sixty (60) calendar days after such occurrence, unless ENGINEER allows claimant an additional period of time in writing to ascertain more accurate data in support of the claim.

9.12 When functioning as interpreter and judge under paragraphs 9.10 and 9.11, it is hereby mutually agreed between OWNER and CONTRACTOR that ENGINEER will not be personally liable in connection with any non-negligent interpretation or decision rendered in good faith in such official and professional engineering capacity. The rendering of a decision by ENGINEER pursuant to paragraphs 9.10 and 9.11 with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.13) will be a condition precedent to any exercise by CONTRACTOR and/or OWNER of such rights or remedies they may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such claim, dispute or other matter.

Limitations on ENGINEER's Responsibilities:

9.13 Neither ENGINEER's authority to act under this Article 9, or elsewhere in the Contract Documents, nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority, shall give rise to any personal or corporate duty or responsibility of ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization performing any of the Work, or to any surety for any of them.

9.14 Whenever in the Contract Documents the terms: "as ordered"; "as directed"; "as required"; "as allowed"; "as approved"; or terms of like effect or import are used, or the adjectives: "reasonable"; "suitable"; "acceptable"; "proper"; or "satisfactory"; or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of ENGINEER as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for general compliance with the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty to supervise or direct the furnishing, performance, or quality control of the CONTRACTOR's Work or any duty or authority to undertake responsibility of the CONTRACTOR contrary to the provisions of paragraph 9.15 or 9.16.

9.15 ENGINEER will not be responsible for CONTRACTOR's means, methods, techniques, quality control, sequences or procedures of construction, or the safety precautions and programs incident thereto, for which CONTRACTOR shall be solely responsible. ENGINEER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

9.16 ENGINEER will not be responsible for the acts and/or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

ARTICLE 10. CHANGES IN THE WORK

10.1 Without invalidating the Agreement and without notice to any surety, OWNER may, at any time, or from time to time, order additions, deletions or revisions in the Work that are in compliance with State public competitive bidding statutes and laws governing Change Orders; these will be authorized by a Written Amendment, a Change Order, or a Work Directive Change. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work

involved, which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

10.2 If OWNER and CONTRACTOR are unable to agree as to the extent, if any, of an increase or decrease in the Contract Price, or an extension or shortening of the Contract Time that should be allowed as a result of a Work Directive Change, a claim may be made therefore as provided in Article 11 or Article 12. All increases or decreases in the Contract Price shall be governed by all State and local laws, statutes, codes, ordinances, rules and regulations governing public competitive bidding and Change Orders.

10.3 CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in paragraphs 3.4 and 3.5, except in the case of an emergency as provided in paragraph 6.24, and except in the case of uncovering Work as provided in paragraph 13.9.

10.4 OWNER and CONTRACTOR may execute appropriate Change Orders (or Written Amendments) covering:

10.4.1 changes in the Work which are ordered by OWNER pursuant to paragraph 10.1; are required because of willing and informed acceptance of defective Work by OWNER under paragraph 13.13; or OWNER correcting defective Work under paragraph 13.14; or are otherwise agreed to by the Parties;

10.4.2 changes in the Contract Price or Contract Time which are agreed to by the Parties; and

10.4.3 changes in the Contract Price or Contract Time which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 9.11; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the Progress Schedule as provided in paragraph 6.31.

10.5 If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Time) is required by the provisions of any Bond to be given to a surety by CONTRACTOR, the giving of any such notice will be CONTRACTOR'S sole responsibility, and the amount of each applicable Bond may be adjusted accordingly.

ARTICLE 11. CHANGE OF CONTRACT PRICE

11.1 The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to CONTRACTOR for properly performing the Work. All original duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR shall be at his expense without change in the original Contract Price.

11.2 The Contract Price may only be changed by a Change Order or by a Written Amendment. Any claim for an increase or decrease in the Contract Price shall be based on initial written notice delivered promptly by the CONTRACTOR or OWNER to the other Party, and to ENGINEER promptly (but in no event later than thirty (30) calendar days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall follow and be delivered within sixty (60) calendar days after such occurrence (unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim), and shall be accompanied by claimant's written statement that the amount claimed covers all known amounts (direct, indirect and consequential) to which the claimant believes he is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Price shall be determined by ENGINEER in accordance with paragraph 9.11, if OWNER and CONTRACTOR cannot otherwise agree on the amount involved. No claim for an adjustment in the Contract Price will be valid, and will be deemed legally waived under this Contract, if not submitted in accordance with this paragraph 11.2.

11.3 The value of any Work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:

11.3.1 Where the Work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the actual quantities of the Work items involved (subject to the provisions of paragraphs 11.9.1. through 11.9.3. inclusive).

11.3.2 By mutual acceptance of a lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 11.6.2.1).

11.3.3 On the basis of the Cost of the Work (determined as provided in paragraphs 11.4 and 11.5), plus a CONTRACTOR's Fee for overhead and profit (determined as provided in paragraphs 11.6 and 11.7).

Cost of the Work:

11.4 The term "Cost of the Work" means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the Cameron County, Texas area and shall include only the following items, and shall not include any of the costs itemized in paragraph 11.5:

11.4.1 Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under Schedules of Job Classifications as set forth by OWNER in the Supplementary Conditions of the Contract Documents. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of any fringe benefits, if any, which shall include social security contributions, unemployment, excise and payroll taxes, workers' or workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday, as may be applicable thereto. Such employees shall include superintendents and

foremen at the Project site. The expenses of performing Work after regular daily working hours on Saturday, Sunday or on legal holidays shall be included in the above, to the extent authorized in an advanced written approval notice by OWNER.

11.4.2 Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR, unless OWNER deposits funds with CONTRACTOR with which to make advanced payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds and all returns from sale of surplus materials and equipment, shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.

11.4.3 Payments made by CONTRACTOR to the Subcontractors for Work performed by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from Subcontractors acceptable to CONTRACTOR, and shall deliver such bids to OWNER who will then determine which bid will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work Plus a Fee, the Subcontractor's Cost of the Work shall be determined in the same manner as CONTRACTOR's Cost of the Work. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable. CONTRACTOR shall accomplish the applicability of the Contract Documents to Subcontractor agreements by using either "flow down" provisions or appropriate recitations in the subcontract agreements of parts of these Contract Documents.

11.4.4 Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys and accountants) employed for services specifically related to the Work.

11.4.5 Supplemental costs actually incurred including the following:

11.4.5.1 The proportion of necessary transportation, travel and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

11.4.5.2 Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the Project site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used, but not consumed, which remain the property of CONTRACTOR.

11.4.5.3 Rentals of all construction equipment and machinery and the parts thereof, whether rented from CONTRACTOR or others, in accordance with written rental agreements produced to OWNER as requested, and the costs of transportation, loading, unloading, installation, dismantling and removal thereof (all in accordance with terms of said rental agreements). The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

11.4.5.4 Any sales, consumer, use or similar taxes actually paid as related to the Work that OWNER is not exempt from paying, and for which CONTRACTOR is liable, as imposed by Laws and Regulations.

11.4.5.5 Deposits forfeited for causes other than negligence of CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them, or for whose acts any of them may be liable, and any royalty payments and fees for permits and licenses.

11.4.5.6 Losses and damages (and related expenses), not compensated to CONTRACTOR by insurance or otherwise, to the Work, or otherwise sustained by CONTRACTOR in connection with the proper performance and furnishing of the Work, provided they have resulted from causes other than the intentional and/or negligent acts and/or omissions of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them, or for whose acts and/or omissions any of them may be liable. Such losses shall include settlements made with the advanced written consent and approval of OWNER. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's Fee. If, however, any such loss or damage requires reconstruction and CONTRACTOR is placed in charge thereof, CONTRACTOR shall be paid for reconstruction services, only at a fee proportionate to that stated in paragraph 11.6.2.

11.4.5.7 The cost of utilities, fuel and sanitary facilities at the Project site.

11.4.5.8 Minor expenses such as telefaxes, long distance telephone calls, telephone service at the Project site, express mailings and similar petty cash items in connection with the Work.

11.4.5.9 Cost of premiums for any additional Bond and insurance coverages required because of any additive Change Orders to the Work.

11.5 The term "Cost of the Work" shall not include any of the following:

11.5.1 Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the Project site or in CONTRACTOR's principal or a branch office for general administration of the Work and not specifically included in the agreed upon Schedule of Job Classifications referred to in paragraph 11.4.1, or specifically covered by paragraph 11.4.4, all of which are to be considered administrative costs covered by the CONTRACTOR's Fee.

11.5.2 Expenses of CONTRACTOR's principal and branch offices, other than any CONTRACTOR's office at the Project site.

11.5.3 Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent CONTRACTOR payments.

11.5.4 Cost of premiums for all Bonds and for all insurance, whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the types of coverage and amounts thereof (except for the cost of premiums covered by subparagraph 11.4.5.9 above).

11.5.5 Costs resulting from the intentional and/or negligent acts and/or omissions of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them, or for whose acts and/or omissions any of them may be liable, including but not limited to, the correction of defective Work, salvaging or disposal of materials or equipment wrongly supplied, and repairing any damage to real or personal property.

11.5.6 Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 11.4.

CONTRACTOR's Fee:

11.6 The CONTRACTOR's Fee allowed to CONTRACTOR for overhead and profit shall be determined as follows:

11.6.1 a mutually acceptable fixed fee; or if none can be agreed upon,

11.6.2 a fee based on the following percentages of the various portions of the Cost of the Work:

11.6.2.1 for costs incurred under paragraphs 11.4.1 and 11.4.2, the CONTRACTOR's Fee shall be fifteen (15%) percent;

11.6.2.2 for costs incurred under paragraph 11.4.3, the CONTRACTOR's Fee shall be five (5%) percent; and if a subcontract is on the basis of Cost of the Work Plus a Fee, the maximum allowable to CONTRACTOR on account of overhead and profit of all Subcontractors shall be fifteen (15%) percent;

11.6.2.3 no fee shall be payable on the basis of costs itemized under paragraphs 11.4.4, 11.4.5 and 11.5;

11.6.2.4 the amount of credit to be allowed by CONTRACTOR to OWNER for any such Contract change which results in a net decrease in cost will be the amount of the actual net decrease, plus a deduction in CONTRACTOR's Fee by an amount equal to ten (10%) percent of the net decrease; and

11.6.2.5 when both additions and credits are involved in any one Contract change, the adjustment in CONTRACTOR'S Fee shall be computed on the basis of the net change in accordance with paragraphs 11.6.2.1 through 11.6.2.4, inclusive.

11.7 Whenever the cost of any Work is to be determined pursuant to paragraph 11.4 or 11.5, CONTRACTOR will timely submit in a written form acceptable to ENGINEER, an itemized cost breakdown together with supporting data.

Cash Allowances:

11.8 It is understood that CONTRACTOR has included in the Contract Price any and all allowances so named in the Contract Documents and shall cause the Work so covered thereby to be done by such Subcontractors or Suppliers, and for such sums within the limit of the allowances as may be acceptable to ENGINEER. CONTRACTOR agrees that:

11.8.1 Any allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Project site, and all applicable non-exempt taxes; and

11.8.2 CONTRACTOR's costs for managing on the Project site, labor, materials and equipment installation costs, overhead, profit and other expenses already contemplated for determining the allowances have been included in the Contract Price and not in the allowances. No demand for additional payment on account of any of such costs will be valid.

Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

Unit Price Work:

11.9

11.9.1 Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit prices for each separately identified item of Unit Price Work, multiplied by the estimated quantity of each item as indicated in the Agreement. The ENGINEER'S estimated quantities of items of Unit Price Work are not guaranteed by the OWNER to be actually performed and are solely for the purpose of comparison of bids and determining an initial Contract Price. Determinations of the actual final quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER in accordance with Paragraph 9.10.

11.9.2 Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

11.9.3 Where the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the ENGINEER's estimated quantity of such item indicated in the Contract Documents (generally plus or minus fifteen percent (15%), and there is no corresponding and offsetting adjustment(s) with respect to any other Unit Price item(s) of Work, and if CONTRACTOR believes that CONTRACTOR has incurred additional expense as a result thereof, CONTRACTOR may make a timely claim for an increase in the Contract Price in accordance with Article 11 and any applicable State law, if the Parties are unable to otherwise agree as to the amount of any such increase. OWNER is also able to file a similar timely claim with ENGINEER if OWNER believes that the quantity of Unit Price Work items has significantly increased to the point that OWNER believes it is owed a credit from CONTRACTOR for any volume discount pricing that CONTRACTOR should have received by purchasing such additional quantities.

ARTICLE 12 -- CHANGE OF CONTRACT TIME

12.1 The Contract Time may only be changed by a Change Order or a Written Amendment. Any claim for an extension or shortening of the Contract Time shall be based on initial written notice delivered by the CONTRACTOR or OWNER to the ENGINEER and to the other Party (but in no event later than thirty (30) calendar days) after the occurrence of the event giving rise to the claim, and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall follow and be delivered within sixty (60) calendar days after such occurrence (unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the claimant's written statement that the time adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Time shall be determined by ENGINEER in accordance with paragraph 9.11, if OWNER and CONTRACTOR cannot otherwise agree. No claim for an adjustment in the Contract Time will be valid and will be deemed legally waived under this Contract, if not submitted in accordance with the requirements of this paragraph 12.1.

12.2 The Contract Time will be extended in an amount equal to time lost due to delays beyond the reasonable control of CONTRACTOR, so long as CONTRACTOR has made good faith efforts to mitigate delaying impacts and if a claim is made therefore as provided in paragraph 12.1. Such delays shall include, but not be limited to, acts, omissions, or neglect by OWNER or others performing additional separate work as contemplated by Article 7, or to fires, floods exceeding the 100 year frequency in Cameron County, labor disputes, epidemics, extremely abnormal weather for Cameron County, Texas, as may be described further in these Contract Documents, or Acts of God.

12.3 **ALL TIME LIMITS STATED IN THE CONTRACT DOCUMENTS ARE MUTUALLY AGREED TO BE OF THE ESSENCE OF THE AGREEMENT.** The provisions of this Article 12 shall not exclude recovery for damages (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court costs) for delay by either Party.

ARTICLE 13 -- WARRANTY AND GUARANTEE; TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

Warranty and Guarantee:

13.1 CONTRACTOR warrants and guarantees to OWNER that all Work will be in accordance with the Contract Documents and will not be defective. Prompt notice of any obvious patent Work defects discovered by OWNER or ENGINEER shall be promptly given to CONTRACTOR in writing. All defective Work, whether or not in place, may be rejected, corrected or accepted as provided in this Article 13. In case of dispute as to the cause of improper functioning of all or any part of the Work, the burden of proof that CONTRACTOR has complied with the Contract Documents rests with CONTRACTOR for this Work. He shall submit in writing to ENGINEER his opinion and basis of proof for the adequacy of his Work. OWNER may have those tests made, which OWNER deems advisable, by an independent testing laboratory of OWNER's choice. If any test so made indicates a defect in material or workmanship, or that one or more manufactured components of the Work are performing below the standard set by the manufacturer's public data and specifications, or the Specifications of these Contract Documents, the entire cost of all such tests shall be paid for by CONTRACTOR, and he shall also pay for retesting of the corrected Work, until in the ENGINEER's opinion, it functions satisfactorily. The Work shall be guaranteed to be free from defects due to faulty workmanship or material for a period of one (1) year from the date of OWNER issue of the Certificate of Acceptance. Work found to be improper or imperfect shall be replaced or redone without cost to OWNER within the one year guarantee period. Neither the Certificate of Acceptance, final payment, or any other provision of the Contract Documents shall relieve CONTRACTOR from his workmanship guarantee. Failure of CONTRACTOR to repair or replace faulty Work entitles OWNER to repair or replace the same and recover the costs from CONTRACTOR and/or his Surety. CONTRACTOR shall be the sole guarantor of the Work installed under this Contract and no third party guarantees/warranties by Subcontractors or suppliers of various components or materials will be acceptable; nor shall agreements with Subcontractors or material or component suppliers by CONTRACTOR reduce CONTRACTOR's sole responsibility to OWNER under this Agreement. All equipment shall be warranted and/or guaranteed by either CONTRACTOR or its supplier/manufacturer by assignment to OWNER, for at least one (1) year from the date of OWNER acceptance of the entire Project. It is anticipated by OWNER and acknowledged by CONTRACTOR that many equipment and material warranties from suppliers/manufacturers shall extend well beyond the initial one (1) year post acceptance period. The CONTRACTOR shall transfer by assignment to the OWNER any and all third party supplier and manufacturer warranties and/or guaranties that remain in effect beyond the one (1) year workmanship guarantee/warranty period. At the option of the OWNER, all materials/equipment are also warranted or guaranteed to OWNER for one (1) year from the date of any early partial acceptance of Work, and beneficial use of a completed system component of Work prior to full integration with the entire completed Project.

Access to Work:

13.2. ENGINEER AND ENGINEER's representatives, other representatives of OWNER, testing agencies and governmental agencies with jurisdictional interests, will have

access to the Work at reasonable times for their observation, inspecting and testing. CONTRACTOR shall promptly provide proper and safe conditions for such authorized and identified reasonable access in accordance with any Occupational Safety and Health Administration (OSHA) and CONTRACTOR's safety program and insurance requirements.

It is agreed by CONTRACTOR that OWNER shall be and is hereby authorized to appoint from time to time, OWNER's subordinate supervisors, observers, and/or inspectors, as the OWNER may deem proper to inspect the material furnished and observe the Work performed under this Agreement, and to see that the material is furnished and Work is generally performed in accordance with the Specifications. This OWNER function, for OWNER's sole benefit, does not excuse the CONTRACTOR from his own quality control assurance, which is solely his responsibility. CONTRACTOR shall furnish all reasonable aid and assistance required by the ENGINEER, and OWNER's subordinate supervisors, observers and/or inspectors to perform observation, inspection and examination of the Work and all parts of the Work. CONTRACTOR shall regard and obey the directions and instructions of the ENGINEER and any OWNER subordinate supervisors, observers and/or inspector so appointed, when such directions are consistent with the obligations of the Contract Documents and included Specifications, provided, however, that should CONTRACTOR object to any order by any OWNER subordinate supervisor or inspector, CONTRACTOR may within ten (10) calendar days submit written notice to ENGINEER for his decision. Except as herein before provided, the authority of OWNER's subordinate supervisors or inspectors shall be limited to the rejection of unsatisfactory Work and materials and to the potential short-term suspension of the Work, until the questions of Work acceptability can be referred to ENGINEER.

13.2.1. CONTRACTOR shall cooperate with any OWNER-provided testing laboratory for the purpose of allowing services of the laboratory to be timely and properly performed. CONTRACTOR shall provide OWNER's representative and testing laboratory a minimum of twenty-four (24) hours notice of readiness for all testing as required by the Specifications or customary construction industry standards. OWNER shall bear the cost of density and concrete testing, for the first test only. Testing of equipment, lines and valves shall be the responsibility of CONTRACTOR and he shall notify ENGINEER and OWNER's Field Representative of his scheduled time for such tests, so that the test can be witnessed by ENGINEER and OWNER'S Field Representative. If initial tests show failure, the CONTRACTOR shall incur the non-reimbursable costs of retesting the areas that failed after CONTRACTOR's corrective action has been taken, including the per diem personnel and equipment costs incurred by OWNER in said retesting. The per diem costs shall be determined based on the hourly wage plus reasonable overhead of ENGINEER's and OWNER's personnel needed to be present at the Project site during retesting, and by the locally prevailing rental rate for the vehicles and equipment utilized in retesting. These retesting costs shall be paid by CONTRACTOR prior to OWNER's interim conditional acceptance of the Work improvements.

Tests and Inspections:

13.3. CONTRACTOR shall give ENGINEER and /or OWNER's Field Representative timely notice of readiness of the Work for all required inspections, tests or approvals.

13.4. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) to specifically be inspected, tested or approved, CONTRACTOR shall assume full responsibility therefore, pay all costs as included in the Contract Price in connection therewith, and furnish ENGINEER the required final certificates of inspection, testing or approval. CONTRACTOR shall also be responsible for and shall pay all non-reimbursable costs in connection with any special inspection or testing required in connection with OWNER's or ENGINEER's approval and acceptance of an alternative Supplier of "or equal" proposed substitutions of materials or equipment proposed by CONTRACTOR to be incorporated in the Work, or of alternative materials or equipment submitted for approval prior to CONTRACTOR's purchase thereof, for incorporation in the Work. The cost of all routine inspections, tests and approvals, other than any of those special inspections which may be required by the Contract Documents to be paid by CONTRACTOR, shall be paid by OWNER (unless otherwise specified).

13.5 All inspections, tests or approvals, other than those required by Laws or Regulations of any public body having jurisdiction, shall be performed by organizations acceptable to OWNER (or by ENGINEER, if so specified).

13.6 If any Work (including the work of others) that is to be inspected, tested or approved is backfilled or otherwise built-in or concealed by CONTRACTOR without written concurrence of ENGINEER, it must, if requested in writing by ENGINEER, be uncovered and revealed for ENGINEER's Resident Project Representative and OWNER Field Representative observation. Such uncovering shall be at CONTRACTOR's non-reimbursable expense, unless CONTRACTOR has given ENGINEER timely written notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness (not to exceed three (3) days) in written response to such CONTRACTOR notice.

13.7 Neither observations by ENGINEER nor inspections, tests or approvals by others shall relieve CONTRACTOR from CONTRACTOR's sole obligations to perform the Work and constantly employ quality control in accordance with the Contract Documents.

Uncovering Work:

13.8 If any Work is backfilled contrary to the advanced written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for ENGINEER's observation and replaced at CONTRACTOR's non-reimbursable expense.

13.9 If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's written request, shall uncover, expose or otherwise make available for observation, inspection or testing as ENGINEER may require, that portion of the Work in question shall be uncovered by CONTRACTOR by furnishing all necessary labor, material and equipment to uncover same. If it is found that such Work is defective, CONTRACTOR shall bear all direct, indirect and consequential non-reimbursable costs of such uncovering, exposure, observation, inspection and testing, and of the satisfactory repair, replacement and reconstruction, (including but not limited to fees and charges of ENGINEER, architects, attorneys and other professionals), and OWNER shall be entitled to an appropriate decrease in the Contract Price for that portion of these costs that CONTRACTOR does not otherwise reimburse to OWNER; and if the Parties are unable to agree

as to the amount thereof, OWNER may make a claim therefore as provided in Article 11. If, however, such Work is not found to be defective, CONTRACTOR may be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, repair, replacement and reconstruction; and, if the Parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12. All increases or decreases in the Contract Price shall be governed by all State and local laws, statutes, codes, ordinances, rules and regulations governing public competitive bidding and Change Orders.

Owner May Stop the Work:

13.10 If the Work is defective in the opinion of the ENGINEER and OWNER, or CONTRACTOR fails to supply sufficient skilled workers, Subcontractors, or suitable materials or equipment, or otherwise fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may issue a written order for CONTRACTOR to stop the Work, or any portion thereof, until the cause for such stop Work order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR, or any other entity.

Correction or Removal of Defective Work:

13.11 If required by ENGINEER, CONTRACTOR shall promptly, as directed in writing, either correct all defective Work, whether or not fabricated, installed or completed, if the Work has been rejected by ENGINEER, and remove it from the Project site and replace it with non-defective Work. CONTRACTOR shall bear all direct, indirect and consequential non-reimbursable costs of such correction or removal (including but not limited to fees and charges of ENGINEER, architects, attorneys and other professionals) made necessary thereby.

One Year Workmanship Correction Period:

13.12 If within one (1) year after the date of OWNER issuance of the Certificate of Acceptance, or such longer period of time as may be prescribed by Laws or Regulations, or by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents, any Work is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions, either correct such defective Work, or, if it has been rejected by OWNER, remove it from the Project site and replace it with non-defective Work. If CONTRACTOR does not promptly comply with the terms of such OWNER instructions, or in an emergency where CONTRACTOR delay would cause serious risk of loss or damage to OWNER's facilities, OWNER may have the defective Work corrected, or the rejected Work removed and replaced, and all direct, indirect and consequential costs of such removal and replacement (including but not limited to fees and charges of ENGINEER, architects, attorneys and other professionals) will be charged to and paid by CONTRACTOR. In special circumstances, where a particular item of equipment is placed in continuous service by OWNER before acceptance of all the Work, the minimum one (1) year

workmanship guarantee and/or equipment warranty correction periods for that item may start to run from an earlier date, if so provided in the Specifications or by Written Contract Amendment.

Acceptance of Defective Work:

13.13 If instead of requiring correction or removal and replacement of defective Work, OWNER (and, prior to ENGINEER's recommendation of final Project payment), prefers to accept it "as is," OWNER may do so in writing. CONTRACTOR shall bear all reasonable direct, indirect and consequential non-reimbursable costs attributable to OWNER's evaluation of, and determination to accept such defective Work (such OWNER costs to be approved by ENGINEER as to reasonableness and may include but not be limited to fees and charges of ENGINEER and any OWNER's, architects, attorneys and other professionals). If any such OWNER acceptance occurs prior to ENGINEER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions to the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the Parties are unable to agree as to the amount thereof, OWNER or CONTRACTOR may make a written claim therefore as provided in Article 11. If the acceptance occurs after such final Project payment, an appropriate amount as determined by OWNER will be charged to and paid by CONTRACTOR to OWNER.

OWNER May Correct Defective Work:

13.14 If CONTRACTOR fails within seven (7) calendar days after written notice by ENGINEER to proceed to correct, and to actually correct defective Work; or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.11; or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents; or if CONTRACTOR fails to comply with any other provision of the Contract Documents; OWNER may, after the pre-requisite seven (7) calendar days written notice to CONTRACTOR, correct and remedy any such CONTRACTOR deficiency. In exercising the rights and remedies under this paragraph, OWNER shall proceed with reasonable expediency. To the extent necessary to complete corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the Work and Project site; take possession of all or part of the Work; and temporarily suspend CONTRACTOR's Work related thereto; take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Project site; and incorporate in the Work all Project materials, and CONTRACTOR shall allow OWNER and ENGINEER, representatives and employees such access to the Project site as may be necessary to enable OWNER to exercise the rights and remedies under this paragraph. All direct, indirect and consequential costs of OWNER in exercising such rights and remedies will be charged against CONTRACTOR, in an amount approved as to reasonableness by ENGINEER, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the Parties are unable to agree as to the amount thereof, OWNER or CONTRACTOR may make a claim therefore as provided in Article 11. Such direct, indirect and consequential OWNER costs will include, but not be limited to: fees and charges of ENGINEER; OWNER's architects; attorneys; and other professionals; all court costs; and all costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of CONTRACTOR's defective Work. CONTRACTOR shall

not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies under this paragraph 13.4.

ARTICLE 14 -- PAYMENTS TO CONTRACTOR AND COMPLETION

Schedule of Values:

14.1 The Schedule of Values established as provided in paragraph 2.9 will serve as the basis for monthly progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units actually completed, multiplied by the per unit price. CONTRACTOR, ENGINEER and OWNER shall also mutually address in the Schedule of Values any periodic CONTRACTOR reimbursements or direct OWNER payments to third-party vendors producing any specially fabricated goods and equipment with longer lead times prior to delivery to the Project site.

Application for Progress Payment:

14.2 At least twenty (20) calendar days before each progress payment is scheduled (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review, an Application for Payment accurately completed and signed by CONTRACTOR, covering the Work completed as of the date of the Application, and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work, but delivered and suitably stored at the Site, or at another bonded and insured secure location off the nearby Project site as agreed to in an advanced writing signed by CONTRACTOR and OWNER, the Application for Payment shall also be accompanied by a bill of sale, invoice, affidavit of bill(s) paid, or other documentation warranting that OWNER has actually received the title ownership of Project materials and equipment still within the care, custody and control of CONTRACTOR for Project Work purposes and free and clear of any attempted liens, charges, security interests and encumbrances (which are hereinafter in these General Conditions referred to as "Encumbrances"), and evidence that the materials and equipment are covered by appropriate property insurance and other security arrangements to protect OWNER's legal interest therein, all of which will be satisfactory to OWNER. The amount of OWNER retainage with respect to progress payments, five percent (5%), is stipulated in the Agreement.

CONTRACTOR's Warranty of Title:

14.3 CONTRACTOR warrants and guarantees that title to any Work equipment and materials itemized in any Application for Payment, whether incorporated in the Project, or delivered and stored at or nearby the Project site, will pass to OWNER no later than the time of any progress payment, free and clear of any and all Encumbrances.

Review of Applications for Progress Payment:

14.4 ENGINEER will, within twenty (20) calendar days after receipt of each Application for Payment from CONTRACTOR, either indicate in writing a recommendation for OWNER payment and process the Application, or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR will make the necessary corrections and promptly resubmit the Application. Twenty (20) calendar days after presentation of the Application for Payment to OWNER with ENGINEER's recommendation, the payment amount recommended will (subject to the provisions of the last sentence of paragraph 14.7) become due, and when due will be promptly paid by OWNER to CONTRACTOR, preferably by electronic transfer.

14.5 ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based upon ENGINEER's limited periodic on-site observations of the Work in progress as an experienced and qualified design professional; and on ENGINEER's review of the Application for Payment and the accompanying data and Schedules; that the Work has progressed to the estimated percentage completion point indicated, that, to the best of ENGINEER's knowledge, information and belief, the status of the Work is in apparent general accordance with the Contract Documents (subject to: a later evaluation of the Work as a functioning whole; prior to or upon Substantial Completion; and subject to the results of any subsequent tests called for in the Contract Documents; and subject to a final determination of quantities and classifications for Unit Price Work under paragraph 9.10; and subject to any other qualifications stated in the ENGINEER's recommendation to OWNER); and that CONTRACTOR is entitled to payment of the amount recommended. However, by recommending any such payment, ENGINEER will not thereby be deemed to have represented that exhaustive or continuous on-site inspections have been made to check the CONTRACTOR's quality or the quantity of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents, or that there may not be other matters or issues between the Parties that might entitle CONTRACTOR to be paid additionally by OWNER, or OWNER to withhold payment to CONTRACTOR.

14.6 ENGINEER's recommendation of final Project payment will constitute an additional representation by ENGINEER to OWNER that to the best of ENGINEER's knowledge, the conditions precedent to CONTRACTOR's being entitled to final Project payment, as set forth in paragraph 14.13, have been fulfilled.

14.7 ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's professional opinion, it would be incorrect to make such representations to OWNER. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence, or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in ENGINEER's opinion, to protect OWNER from Project loss because:

14.7.1 the Work is defective, or completed Work has been damaged requiring CONTRACTOR correction or replacement.

14.7.2 the Contract Price has been reduced by Written Amendment or Change Order.

14.7.3 OWNER has been required to correct defective Work or complete Work in accordance with paragraph 13.14, or

14.7.4 because of ENGINEER's actual knowledge of the occurrence of any of the events enumerated in paragraphs 15.2.1 through 15.2.9 inclusive.

OWNER may for its own benefit and protection and not for the direct benefit of any third parties, refuse to make CONTRACTOR payment in whole or in part of the amount recommended by ENGINEER, because claims have been made against OWNER on account of CONTRACTOR's improper performance of the Work; or payment bond claims and inquiries have been filed with OWNER or surety by third-parties in connection with the Work and OWNER may wish to consult with CONTRACTOR and/or CONTRACTOR's surety about the status of CONTRACTOR sub-tier payments, or there are other items entitling OWNER to a set-off against the payment amount recommended, but OWNER must give CONTRACTOR written notice stating the reasons for any non-payment to CONTRACTOR.

Substantial Completion:

14.8 When CONTRACTOR considers the entire Work ready for OWNER's intended purpose and use, CONTRACTOR shall notify ENGINEER in writing that the entire Work is Substantially Complete (except for minor items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Within a reasonable time thereafter, OWNER, ENGINEER and CONTRACTOR shall make a joint inspection of the Work to determine the status of Project completion. If ENGINEER does not consider the Work Substantially Complete, ENGINEER will promptly notify CONTRACTOR in writing giving the reasons therefore. If ENGINEER considers the Work Substantially Complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of pending Work items to be completed or corrected by CONTRACTOR before final payment ("punch-list"). OWNER shall have ten (10) calendar days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not Substantially Complete, ENGINEER will within twenty (20) calendar days after submission of the tentative certificate to OWNER, notify CONTRACTOR in writing, stating the reasons for no accomplishment of Substantial Completion. If, after consideration of OWNER's written objections regarding non-issuance of a Substantial Completion certificate, ENGINEER considers the Work Substantially Complete, ENGINEER will within said twenty (20) calendar days execute and deliver to OWNER and CONTRACTOR, a definitive certificate of Substantial Completion (with a final punch list of items to be completed or corrected) reflecting such changes from the tentative list as ENGINEER believes justified, after consideration of any objections from OWNER. At the time of delivery of the definitive certificate of Substantial Completion, ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to the division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to any Project security, operation, safety, maintenance, HVAC, utilities, insurance,

warranties, and guarantees. OWNER and CONTRACTOR shall agree in writing regarding the final division of responsibilities, and so inform ENGINEER.

14.9 OWNER shall have the right to exclude CONTRACTOR from portions of the Project site after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to portions of the Work to complete or correct items on the final punch list.

Partial Utilization:

14.10 Use by OWNER of any finished part of the Work, which has specifically been identified in the Contract Documents, or which OWNER, ENGINEER and CONTRACTOR subsequently agree constitutes a separately functioning and useable part of the Work that can be utilized by OWNER without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work, subject to the following:

14.10.1 OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for OWNER's intended use and purpose and Substantially Complete. If CONTRACTOR agrees, CONTRACTOR will certify in writing to OWNER and ENGINEER that said part of the Work is Substantially Complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Additionally, CONTRACTOR at any time may notify OWNER and ENGINEER in writing, that CONTRACTOR considers any such part of the Work ready for OWNER's intended use and purpose, and substantially complete, and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after such CONTRACTOR request, OWNER, ENGINEER and CONTRACTOR shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER considers that part of the Work to be Substantially Complete, the provisions of paragraphs 14.8 and 14.9 will apply with respect to issuance of any certification of Substantial Completion for that part of the Work, and finalizing the division of responsibilities and access thereto.

14.10.2 OWNER may at any time request CONTRACTOR in writing to permit OWNER to take over operation of any such part of the Work, although it is not Substantially Complete. A copy of such request will be sent to ENGINEER and within a reasonable time thereafter, OWNER, ENGINEER and CONTRACTOR shall make an inspection of that part of the Work to determine its status of completion and will prepare a punch-list of the items remaining to be completed or corrected thereon before final payment. If CONTRACTOR does not object in writing to OWNER and ENGINEER within seven (7) calendar days that such part of the Work is not ready for separate operation by OWNER, ENGINEER will finalize the list of items to be completed or corrected and will deliver such list to OWNER and CONTRACTOR, together with a written statement as to the division of responsibilities pending final payment between OWNER and CONTRACTOR, with respect to security, operation, safety, maintenance, HVAC, utilities, insurance, warranties and guarantees for that part of the Work, which will become binding upon OWNER and CONTRACTOR at the time when OWNER takes over such operation (unless they shall have otherwise agreed in writing and so informed ENGINEER). During such OWNER operation and prior to Substantial Completion of such part of the Work, OWNER shall allow

CONTRACTOR reasonable access to complete or correct items on any punch list, and to complete other related Work.

14.10.3 No OWNER use, occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirements of paragraph 5.9 in respect of CONTRACTOR's property insurance notice and endorsement.

Final Inspection:

14.11 Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, ENGINEER will make a final inspection with OWNER and CONTRACTOR and will notify CONTRACTOR in writing of all particulars (a revised short-list) in which this inspection reveals that the Work is incomplete or defective. CONTRACTOR shall immediately take such corrective measures as are necessary to remedy such remaining deficiencies.

A qualified person(s) representing CONTRACTOR shall be present at this final inspection. Prior to this inspection, all Work shall have been completed, tested, adjusted and in final operating condition, if required by the Project Specifications.

Final Application for Payment:

14.12 After CONTRACTOR has completed all such final Work corrections to the satisfaction of ENGINEER and delivered certificates of inspection, marked-up record documents, if any, depicting as-built conditions (as provided in paragraph 6.21) and other important documents--all as required by the Contract Documents; and after ENGINEER has indicated that the Work is acceptable (subject to the provisions of paragraph 14.16), CONTRACTOR may make application for final payment following the procedure for monthly progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers (satisfactory to OWNER) of all third-party claims arising out of, or filed in connection with the Work. In lieu thereof and as approved by OWNER, CONTRACTOR may furnish third-party receipts or releases in full; a sworn affidavit of CONTRACTOR that the releases and receipts include prior CONTRACTOR payments for all labor, services, material and equipment for which a timely Payment Bond claim could be filed, and that all payrolls, material and equipment bills, and other CONTRACTOR indebtedness connected with the Work, for which OWNER or OWNER's property might in any way be encumbered, have been paid or otherwise satisfied; and a written consent of the Surety to OWNER's final payment, if any is required by CONTRACTOR's Surety. **IF ANY SUBCONTRACTOR OR SUPPLIER FAILS TO FURNISH CONTRACTOR A RELEASE OR RECEIPT IN FULL, CONTRACTOR MAY FURNISH A SPECIAL INDEMNITY BOND, OR OTHER COLLATERAL SATISFACTORY TO OWNER, TO INDEMNIFY, HOLD HARMLESS, AND FULLY PROTECT OWNER AGAINST ANY POTENTIAL THIRD-PARTY CLAIM.**

Final Payment and Acceptance:

14.13 If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment, and accompanying documentation (all as required by the Contract Documents), ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will, within twenty (20) calendar days after receipt of the final Application for Payment, indicate in writing, ENGINEER's recommendation to OWNER for payment and process the Application for Payment. Thereupon ENGINEER will give written notice to OWNER and CONTRACTOR that the Work is acceptable, subject to the provisions of paragraph 14.16. Otherwise, ENGINEER will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall promptly make the necessary corrections and resubmit the Application. Thirty (30) calendar days after presentation to OWNER of the final Application for Payment and accompanying documentation, in appropriate final form and substance, and with ENGINEER's recommendation and notice of acceptability, the final amount recommended by ENGINEER will become due and will be paid by OWNER to CONTRACTOR.

CONTRACTOR shall submit satisfactory evidence to the OWNER and ENGINEER that all payrolls, and other CONTRACTOR indebtedness connected with the Work have been paid, before a Final Certificate of Acceptance is issued.

14.14 If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed, and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.1, the written consent of the surety to the partial payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such Payment. Such partial payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a final waiver of claims by OWNER.

Contractor's Continuing Obligation:

14.15 CONTRACTOR'S obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or final payment by ENGINEER; nor the issuance of a Certificate of Substantial Completion or Final Acceptance; nor any payment by OWNER to CONTRACTOR under the Contract Documents; nor any use or occupancy of the Work or any part thereof by OWNER; nor any act of Work acceptance by OWNER; nor any failure to do so; nor the issuance of a notice of acceptability by ENGINEER pursuant to paragraph 14.13; nor any correction of defective Work by OWNER, will constitute an acceptance of Work not in accordance with the Contract Documents, or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents (except as provided in paragraph 14.16).

Waiver of Claims:

14.16 The making and acceptance of final payment will constitute:

14.16.1 a waiver of all claims by OWNER against CONTRACTOR, except any timely filed third party claims arising from unsettled payment bond claims; from latently defective Work appearing after final inspection pursuant to paragraph 14.11; or from failure to comply with the Contract Documents or the terms of any special guarantees specified therein; however, it will not constitute a waiver by OWNER of any rights regarding CONTRACTOR's continuing obligations under the Contract Documents; and

14.16.2 a waiver of all claims by CONTRACTOR against OWNER, other than those previously, properly, and timely made in writing and still unsettled.

ARTICLE 15 -- SUSPENSION OF WORK AND TERMINATION

Owner May Suspend Work:

15.1 OWNER may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than ninety (90) cumulative (not necessarily consecutive) calendar days by notice in writing to CONTRACTOR and ENGINEER, which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR may be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension, if CONTRACTOR demonstrates an approved claim therefore as provided in Articles 11 and 12. Any increase or decrease in the Contract Price shall be governed by all State and local laws, statutes, codes, ordinances, rules and regulations governing public competitive bidding and Change Orders.

Owner May Terminate:

15.2 Upon the occurrence of any one or more of the following events:

15.2.1 if CONTRACTOR commences a voluntary case under any chapter of the Bankruptcy Code (Title 11, United States Code), as now or hereafter in effect, or if CONTRACTOR takes any equivalent or similar action by filing a petition or otherwise, under any other federal or Texas law in effect at such time, relating to the bankruptcy or insolvency;

15.2.2 if a petition is filed against CONTRACTOR under any chapter of the Bankruptcy Code as now or hereafter in effect at the time of filing, or if a petition is filed seeking any such equivalent or similar relief against CONTRACTOR under any other federal or Texas law in effect at the time relating to bankruptcy or insolvency;

15.2.3 if CONTRACTOR makes a general assignment for the benefit of creditors;

15.2.4 if a trustee, receiver, custodian or agent of CONTRACTOR is appointed under applicable law or under contract, whose appointment or authority to take charge of the property of CONTRACTOR is for the purpose of enforcing a lien against such CONTRACTOR

property, or for the purpose of general administration of such CONTRACTOR property, for the benefit of CONTRACTOR's creditors;

15.2.5 if CONTRACTOR admits in writing an inability to pay its debts generally as they become due;

15.2.6 if CONTRACTOR persistently fails to perform the Work in accordance with the Contract Documents (including but not limited to, failure to supply sufficient skilled workers or equipment, or failure to adhere to the Progress Schedule established under paragraph 2.9, as revised from time to time);

15.2.7 if CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;

15.2.8 if CONTRACTOR disregards the rights of OWNER; or

15.2.9 if CONTRACTOR otherwise violates in any substantial and material way, any provisions of the Contract Documents;

OWNER may, after giving CONTRACTOR and the surety seven (7) calendar days written notice, and to the extent permitted by Laws and Regulations: terminate the services of CONTRACTOR; exclude CONTRACTOR from the Project site and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment and machinery at the Project site; and use the same to the full extent they could be used by CONTRACTOR (without OWNER liability to CONTRACTOR for trespass or conversion), and finish the Work as OWNER may deem expedient. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds the OWNER's direct, indirect and consequential costs of completing the Work (including but not limited to fees and charges of ENGINEER, other engineers, architects, attorneys and other professionals and court costs), such excess will be paid to CONTRACTOR or surety. If such OWNER costs exceed such unpaid balance of the Contract Price, CONTRACTOR or surety shall pay the difference to OWNER. Such costs incurred by OWNER will be approved as to reasonableness by ENGINEER and incorporated in a Change Order, but when exercising any rights or remedies under this paragraph, OWNER shall not be required to obtain the lowest price for the Work performed.

15.3 Where CONTRACTOR's services have been so terminated by OWNER, that termination will not affect any rights or remedies of OWNER under this continuing Agreement against CONTRACTOR then existing, or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by OWNER will not release CONTRACTOR from ongoing liability under this Agreement.

15.4 Upon seven (7) calendar days written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy, elect to abandon the Work and terminate the Agreement for OWNER's convenience. In such case, CONTRACTOR shall mitigate demobilization costs as best as possible and be paid for all Work properly executed and expenses sustained, plus reasonable termination expenses, which will

include, but not be limited to, direct, indirect and consequential costs (including, but not limited to, fees and charges of CONTRACTOR's engineers, architects, attorneys and other professionals).

ARTICLE 16 -- TIME FOR SUBSTANTIAL COMPLETION AND LIQUIDATED DAMAGES.

16.1. IT IS HEREBY UNDERSTOOD AND MUTUALLY AGREED, BY AND BETWEEN THE PARTIES HERETO, THAT THE DATE OF BEGINNING, RATE OF PROGRESS AND THE TIME FOR SUBSTANTIAL COMPLETION OF THE WORK TO BE PERFORMED HEREUNDER ARE ESSENTIAL CONDITIONS OF THIS CONTRACT; and it is further mutually understood and agreed, by and between the Parties hereto, that the time to perform the Work embraced in this Contract shall be commenced on a date to be specified in the Notice to Proceed.

16.2 CONTRACTOR hereby agrees that said Work shall be prosecuted regularly, diligently, and uninterrupted at such rate of progress as will insure Substantial Completion thereof within the time specified. It is expressly understood and mutually agreed, by and between the Parties hereto, that the time for the Substantial Completion of the Work described herein in calendar days is a reasonable time for Substantial Completion of same, taking into consideration the average climatic range and weather conditions the CONTRACTOR must reasonably anticipate is already included in the calculation of the performance time specified herein, and CONTRACTOR has assessed the usual industrial and labor conditions prevailing in the Cameron County area.

16.3 If CONTRACTOR shall neglect, fail or refuse to Substantially Complete the Work within the mutually agreed to time herein specified, then CONTRACTOR does hereby agree, as a part of the consideration for the awarding of this Contract, to pay the OWNER the mutually agreed to amount specified in the Construction Agreement, not as a penalty, but as liquidated damages for such breach of Contract for each and every calendar day that CONTRACTOR shall be in default, after the time stipulated in the Contract Documents for Substantially Completing the Work.

16.4 The damage to OWNER by reason of this Work not being Substantially Completed as of the mutually agreed to performance time period are incapable of definite ascertainment by either Party, and therefore the Parties hereto have mutually fixed and limited such damages to the sum stipulated in the Construction Agreement for each calendar day the Project runs beyond such Substantial Completion date, and the mutual agreement for such damages constitutes a part of the consideration for entering the Agreement. It is further mutually agreed that **TIME IS OF THE ESSENCE** for each and every portion of this Agreement and of the Specifications, wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract, any additional time is allowed for the Substantial Completion of any Work, the new time fixed by such extension shall also be **OF THE ESSENCE** for this Agreement. Provided that CONTRACTOR shall not be assessed with the mutually agreed to liquidated damages or any excess cost when the delay in the Substantial Completion of Work is due:

16.4.1 To any preference, priority or allocation order duly issued by the United States Federal Government.

16.4.2 To unforeseeable causes beyond the control and without the fault or negligence of CONTRACTOR, including, but not restricted to: Acts of God; or of the public enemy; acts of the OWNER; acts of another contractor in the performance of a separate contract with the OWNER; fires; floods exceeding the 100 year frequency in Cameron County, Texas; epidemics; quarantine restrictions; strikes; freight embargoes and unusually severe weather not customary for the Cameron County, Texas area and not already included in the calculation of the performance time specified herein.

16.4.3 To any delays of Subcontractors and/or CONTRACTOR's equipment/material suppliers occasioned by any of the causes specified in 16.4.1 or 16.4.2.

16.4.4 Provided further, that CONTRACTOR shall immediately attempt to mitigate the impacts of the delay, and within seven (7) calendar days from the beginning of such delay, notify OWNER, in writing, of the causes for the delay. ENGINEER and OWNER shall then ascertain the facts and extent of the delay and OWNER will notify CONTRACTOR within a reasonable time of OWNER's decision in the matter regarding any adjustment to the Contract Time and a mutually acceptable Project Schedule recovery plan.

ARTICLE 17 -- MISCELLANEOUS

Giving Notice:

17.1 Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly performed if delivered in person to the CONTRACTOR's Project Superintendent or mailed to an officer of the corporation in the case of the CONTRACTOR; or to the General Manager and CEO of the BPUB in the case of the OWNER; or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the provider of the notice. **PROVIDING TIMELY NOTICE AS REQUIRED BY THE NUMEROUS PARAGRAPHS HEREIN IS A MUTUALLY AGREED TO ESSENTIAL TERM OF THIS CONTRACT FOR BOTH PARTIES, AND FAILURE TO PROVIDE SAME CONSTITUTES A MATERIAL BREACH OF THE CONTRACT AND A WAIVER OF CERTAIN REMEDIES THAT OTHERWISE WOULD HAVE BEEN AVAILABLE TO A PARTY HEREUNDER HAD PROPER TIMELY NOTICE BEEN PROVIDED.**

Computation of Calendar Day Time:

17.2 When any period of time is referred to in the Contract Documents by "days", and the OWNER'S format for scheduling the performance time on the Project is by utilizing calendar days in lieu of "working days," it will be computed as calendar days, to exclude the first and include the last calendar day of such measured period. If the last calendar day of any such period falls on a calendar day listed as a local BPUB holiday by the Contract Documents, such calendar day will be omitted from the computation.

17.2.1 A calendar day consists of twenty-four (24) hours and is measured from midnight on one day, to the next midnight, and shall constitute a single calendar day.

General:

17.3 Should OWNER suffer injury or damage to person or property because of any error, omission or negligent act of the CONTRACTOR, or of any of the CONTRACTOR's, Subcontractor's, employees or agents, or others for whose negligent acts and/or omissions CONTRACTOR is legally liable, OWNER's claim will be made in writing to the CONTRACTOR within a reasonable time of the first occurrence or observation of such injury or damage. The provisions of this paragraph 17.3 shall not be construed as a substitute for, or a waiver of, the legal provisions of any applicable statute of limitations or repose.

17.4 The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the Parties hereto, and, in particular but without limitation, the conditions, warranties, guarantees and obligations imposed upon CONTRACTOR by paragraphs 6.32, 13.1, 13.12, 13.14, 14.3 and 15.2, and all of the rights and remedies available to OWNER thereunder; are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to OWNER which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this paragraph 17.4 will be as effective as if repeated specifically in all the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply. All representations, conditions, warranties and guarantees made in the Contract Documents will survive the execution, final payment and termination or completion of the Agreement. All CONTRACTOR recitations contained in any document required by OWNER, whether delivered at the time of the execution of the Construction Agreement, or at a later date, shall constitute legal and binding representations, warranties and guarantees by CONTRACTOR herein.

17.5 CONTRACTOR shall comply with the "anti-kickback" provisions of the Copeland Act now codified at 18 U. S. C. A. §874, and all amendments or modifications of the original Act of June 13, 1934.

SUPPLEMENTARY CONDITIONS

SECTION 1 - WAGE AND LABOR STANDARD PROVISIONS - 100% NON - FEDERALLY FUNDED CONSTRUCTION

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1. GENERAL STATEMENT

This is a 100% Non-Federally funded and competitively bid Public Works Contract and Article 5159a, Revised Civil Statutes of Texas, as amended, requires that not less than the general prevailing wage rates (minimum hourly base pay and minimum hourly fringe benefit contribution) for work of similar character be paid to Contractor and Subcontractor employees. These local prevailing and adopted wage rates are derived from the most current applicable federal prevailing wage rates for Cameron County, Texas as published by the United States Department of Labor, (DOL) Dallas, Texas. Copies of the wage rates applicable to the Project at the time of bidding are contained at the end of this Supplementary Conditions Section 1, and are included instruments of this Contract and full compliance with same shall be required.

Any deviation from Wage and Labor Standard Provisions compliance may be cause for OWNER's withholding either interim or final payment to the CONTRACTOR until such deviations are properly corrected.

2. OWNER'S FINANCE DEPARTMENT WAGE & HOUR OFFICE, PROJECT RESPONSIBILITIES

The OWNER's FINANCE DEPARTMENT is primarily responsible for all Wage and Labor Standard Provisions investigation and enforcement and will monitor CONTRACTOR/Subcontractor practices to assure the OWNER that:

- a. Appropriate weekly compliance statements and payroll records are submitted to the OWNER by the CONTRACTOR/Subcontractors and that such are reviewed for compliance with Wage and Labor Standard Provisions.
- b. Apprentices/trainees working on the Project are properly identified by CONTRACTOR/Subcontractor on payroll records and documented as being included in programs currently sanctioned by appropriate federal or Texas regulatory agencies.
- c. Applicable Wage Determination Decisions, including any applicable modifications, and related statements are posted at the Project Work site by the CONTRACTOR and that proper job classifications and commensurate minimum hourly base and any applicable fringe wage rates are paid.
- d. Employees are periodically interviewed (at random) on each Project as required.
- e. That no person employed by CONTRACTOR/Subcontractor is induced against his will, by any means, to give up any part of the compensation to which he is otherwise entitled.
- f. That any and all periodic administrative directives to the Wage & Hour Monitor (TITLE) from the OWNER's Finance Department and Board of Trustees are being implemented.

3. CLAIMS & DISPUTES PERTAINING TO WAGE RATES

Claims and disputes not promptly and routinely settled by the CONTRACTOR/Subcontractor and employees pertaining to wage rates, or to job classifications of labor employed upon the Work covered by this Contract, shall be reported by the employee in writing, within sixty (60) Calendar Days of employee's receipt of any allegedly incorrect classification, wage or benefit report, to the Wage & Hour Monitor for further investigation. Claims and disputes not reported by the employee to the Wage & Hour Monitor in writing within the sixty (60) Calendar Day period shall be deemed waived by the employee for the purposes of the OWNER administering and enforcing the OWNER's Contract rights against the CONTRACTOR on behalf of the employee. Waiver by the employee of this OWNER intervention shall not constitute waiver by the OWNER or employee to independently pursue contractual rights it has against the CONTRACTOR/Subcontractor for breach of Contract and other sanctions available to enforce the Wage and Labor Standard Provisions.

4. BREACH OF WAGE AND LABOR STANDARD PROVISIONS

The OWNER reserves the right to terminate this Contract for cause if the CONTRACTOR/Subcontractors shall knowingly and continuously breach, without timely restitution or cure, any of these governing Wage and Labor Standard Provisions. A knowing and unremedied proven violation of these Wage and Labor Standard Provisions may also be grounds for a "non-responsibility" determination by OWNER thereby jeopardizing CONTRACTOR/Subcontractor from future OWNER contracts for lack of responsibility to perform future work, as determined by the OWNER. Recurrent violations, whether remedied or not, will be considered by the OWNER when assessing the responsibility history of a potential contractor/subcontractor prior to competitive award of future OWNER Public Works projects. The general OWNER remedies stated in this paragraph 4. above, are not exhaustive and not cumulative, for the OWNER reserves legal and contractual rights to other specific remedies outlined herein below and in other parts of this Contract and as are allowed by applicable OWNER resolutions, Texas and federal statutes.

5. EMPLOYMENT OF LABORERS/MECHANICS NOT LISTED IN WAGE DETERMINATION DECISION

In the event the CONTRACTOR/Subcontractor discovers that construction of a particular Work element requires a certain employee classification and skill that is not listed in the wage determination decision contained in the original Contract Documents, CONTRACTOR/Subcontractors will make prompt inquiry (at least twenty-one (21) Calendar Days before bidding, if possible) to the OWNER identifying that class of laborers/mechanics not listed in the current pre-bid wage determination decision who are intended to be employed, or who are being employed, under the Contract. Using his best judgment and information resources available to him at the time, and any similar, prior OWNER or Federal Department of Labor decisions, the Wage & Hour Monitor, shall

classify said laborers/mechanics by issuing a special local wage determination decision to the bidders or CONTRACTOR/Subcontractor, which shall be enforced by the OWNER.

6. MINIMUM WAGE

All laborers/mechanics employed to construct the Work governed by this Contract shall be paid not less than weekly the full amount of wages due (minimum hourly base pay and any applicable minimum hourly fringe benefit contribution for all hours worked, including overtime) for the immediately preceding pay period, computed at wage and fringe rates not less than those contained in the wage determination decision included in this Contract. Only payroll deductions as are mandated by Texas or federal law, and those legal deductions previously approved in writing by the employee, or as are otherwise permitted by Texas or federal law, may be withheld by the CONTRACTOR/Subcontractor.

Should the CONTRACTOR/Subcontractor subscribe to fringe benefit programs for employees, such programs shall be fully approved by the OWNER in adopting a previous U.S. Department of Labor decision on such fringe benefit programs or by applying DOL criteria, in rendering a local decision on the adequacy of the fringe benefit programs. The approved programs shall be in place at the time of OWNER's Contract execution and the provisions thereof shall be disclosed to the CONTRACTOR, for legal review prior to Project commencement, if a written request for same is submitted by CONTRACTOR/Subcontractor prior to CONTRACTOR's execution of the Construction Agreement.

Regular CONTRACTOR/Subcontractor contributions made to, or costs incurred for, approved fringe benefit plans, funds or other benefit programs that cover periods of time greater than the one week payroll period (e.g. monthly or quarterly, etc.) shall be prorated by the CONTRACTOR/Subcontractor on weekly CONTRACTOR payroll records to reflect the equivalent value of the hourly and weekly summary of fringe benefits per employee.

7. OVERTIME COMPENSATION ON NON-FEDERALLY FUNDED PROJECTS

No CONTRACTOR/Subcontractor contracting for any part of the non-federally funded Contract Work (except for Project site related security guard services), which may require or involve the employment of laborers/mechanics, shall require or permit any laborer/mechanic in any seven (7) Calendar Day Work period in which he, she is employed on such Work, to Work in excess of forty (40) hours in such Work period, unless said laborer/mechanic receives compensation at a rate not less than one and one-half (1 ½) times the basic hourly rate of pay for all hours worked in excess of forty (40) hours in a seven (7) Calendar Day Work period. Any applicable fringe benefits must be paid for straight time and overtime; however, fringe benefits are not included when computing the overtime rate.

8. PAYMENT OF CASH EQUIVALENT FRINGE BENEFITS

The CONTRACTOR/Subcontractor is allowed to pay a minimum hourly cash equivalent of any applicable minimum hourly fringe benefits listed in the wage determination decision, in lieu of the contribution of benefits to a permissible fringe benefit plan, for all hours worked, including overtime, as described in paragraphs 6. and 7. above. An employee is not allowed to receive less than the minimum hourly basic rate of pay specified in the applicable wage determination decision.

9. WORK CONDUCTED ON HOLIDAYS-NON-FEDERALLY FUNDED PROJECTS

If a laborer/mechanic is employed in the normal course and scope of his or her Work on the jobsite on New Year's Day, Martin Luther King Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Christmas Day, or any additional local OWNER holidays specified by the OWNER in the Contract Documents or the Calendar Days observed as such in any given year, Work shall be paid for at no less than one and one-half (1 1/2) times the regular minimum hourly base pay regardless of the total number of hours the laborer/mechanic has accumulated during the pay period.

10. UNDERPAYMENT OF WAGES OR SALARIES

- a. When a "full investigation" (as called for in and as construed under Article 5159a, Sec. 2 and as may be further generally described in any administrative directive to the Wage & Hour Monitor from the OWNER), evidences underpayment of wages by CONTRACTOR/Subcontractor to laborers/mechanics employed upon the Work covered by this Contract, the OWNER, in addition to such other rights as may be afforded it under Texas and/or federal law and/or this Contract, shall withhold from the CONTRACTOR, out of any payments (interim progress and/or final) due the CONTRACTOR, so much thereof as the OWNER may consider necessary to secure ultimate payment by the appropriate entity to such laborers/mechanics, of full wages required by this Contract, plus possible penalty (See b. below). The amount so withheld, excluding any possible penalty to be retained by the OWNER, may be disbursed at an appropriate time after "full investigation" by the Wage & Hour Monitor, for and on behalf of the CONTRACTOR/Subcontractor (as may be appropriate), to the respective laborers/mechanics to whom the same is due, or on their behalf to fringe benefit plans, funds, or programs for any type of minimum fringe benefits prescribed in the applicable wage determination decision.
- b. Article 5159a, Revised Civil Statutes of Texas, as amended, states that the CONTRACTOR shall forfeit as a penalty to the OWNER the sum of sixty dollars (\$60.00) for each Calendar Day, or portion thereof, for each laborer, workman, or mechanic, who is paid less than the said stipulated rate for any Work done under this Contract, whether by the CONTRACTOR himself, or by any Subcontractor working under him. Pursuant to and supplemental to this statutory authority, the OWNER and the CONTRACTOR/Subcontractor contractually acknowledge and agree that said sixty dollar (\$60.00) statutory penalty shall apply to any violations

of paragraphs 6,7, or 9 herein, resulting from CONTRACTOR/Subcontractor underpayment violations.

- c. If unpaid or underpaid workers cannot be located by the CONTRACTOR/Subcontractor or the OWNER after diligent efforts to accomplish same, unpaid or underpaid wages shall be reserved by the OWNER in a special "unfound worker's account" established by the OWNER, for such CONTRACTOR/Subcontractor employees. If after one (1) year from the final acceptance of the Project by the OWNER, workers still cannot be located, in order that the OWNER can make effective interim re-use of the penalty money, such wages and any associated statutory penalties may be used to defray actual costs incurred by the OWNER in attempting to locate said workers, and any remaining monies may then revert back to the OWNER's original funding source for the Project. However, unpaid or underpaid workers for which money was originally reserved are eligible to claim recovery from the OWNER for a period of not-to-exceed three (3) years from the final acceptance of the Project by the OWNER. Claimant recovery after expiration of the three (3) year period is prohibited.

11. DISPLAYING WAGE DETERMINATION DECISIONS/AND NOTICE TO LABORERS/MECHANICS STATEMENT

The applicable wage determination decision(s) as described at the end of this Supplementary Conditions Section 1 (and as specifically included in each project contract), outlining the various worker classifications and mandatory minimum wages and minimum hourly fringe benefit deductions, if any, of laborers/mechanics employed and to be employed upon the Work covered by this CONTRACT, shall be displayed by the CONTRACTOR/Subcontractor at the site of Work in a conspicuous and prominent public place, readily and routinely accessible to workmen for the duration of the Project. In addition, the CONTRACTOR/Subcontractor agrees with the contents of the following statement, and shall display same, in English and Spanish, near the display of the wage determination decision at the Project site of Work:

NOTICE TO LABORERS/MECHANICS

Both the Brownsville Public Utilities Board and the CONTRACTOR/Subcontractor agree that you must be compensated with not less than the minimum hourly base pay and any required minimum hourly fringe benefit contribution in accordance with the wage rates publicly posted at this jobsite, and as are applicable to the classification of Work you perform.

Additionally, you must be paid not less than one and one-half times (1 ½) your basic hourly rate of pay for any hours worked over 40 in any seven (7) Calendar Day Work period, and for any Work conducted on New Year's Day, Martin Luther King Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, and Christmas Day and other possible locally observed holiday(s), or the Calendar Days observed as such in any given year.

Apprentice and trainee hourly wage rates and ratios apply only to apprentices and trainees recognized under approved Federal, or State, apprenticeship training programs registered with the Bureau of Apprenticeship and Training, U.S. Dept. of Labor.

If you believe that your employer is not paying the posted minimum wage for the type of Work you do, you must make direct inquiry to your employer and also inquire in writing, within sixty (60) Calendar Days of your receipt of any allegedly incorrect wage or benefit check or report, to the BPUB Wage & Hour Monitor. It is mandatory that you promptly file written inquiry of any allegedly incorrect wage or benefit checks or reports with the BPUB's Wage & Hour Monitor within the sixty (60) Calendar Day period, so that you do not waive your potential right of recovery under the provisions of the BPUB's construction Contract that governs this Project.

Both the BPUB and the CONTRACTOR/Subcontractor agree that no laborer/mechanic who files a complaint or inquiry concerning alleged underpayment of wages or benefits, shall be discharged by the employer, or in any other manner be discriminated against by the employer, for filing such complaint or inquiry.

12. PAYROLLS & BASIC PAYROLL RECORDS

- a. The CONTRACTOR and each Subcontractor shall prepare payroll reports in accordance with the "General Guideline" instructions furnished by the OWNER of the Project. Such payroll submittals shall contain the name and address of each such employee, his correct labor classification, rate of pay, daily and weekly number of hours worked, any deductions made, and actual basic hourly and fringe benefits paid. The CONTRACTOR shall submit payroll records each week, and no later than seven (7) working days following completion of the workweek being processed, to the OWNER. These payroll records shall include certified copies of all payrolls of the CONTRACTOR and of his Subcontractors, it being understood that the CONTRACTOR shall be responsible for the submission and general mathematical accuracy of payrolls from all of his Subcontractors. Each such payroll submittal shall be on forms deemed satisfactory to the Wage & Hour Monitor and shall contain a "Weekly Statement of Compliance", as called for by the Contract Documents. Such payrolls will be forwarded to the Wage & Hour Monitor.
- b. Copies of payroll submittals and basic supporting payroll records of the CONTRACTOR/Subcontractors accounting for all laborers/mechanics employed under the Work covered by this Contract, shall be maintained by CONTRACTOR/Subcontractor during the course of the Work, and preserved for a period of three (3) years after completion of the Project. The CONTRACTORS/Subcontractors shall maintain records which demonstrate: any contractor commitment to provide fringe benefits to employees as may be mandated by the applicable wage determination decision; that the plan or program is adjudged financially responsible by the appropriate approving authority, (i.e. U.S. Department of Labor, U.S. Department of Treasury, etc.); and that the provisions, policies, certificates, and description of benefits of the plan or program as may be periodically amended, have been clearly communicated in a timely manner and in writing, to the laborers/mechanics affected, prior to their performing Work on the Project.

- c. The CONTRACTOR/Subcontractor shall make the above records available for inspection, copying, or transcribing by the Wage & Hour Monitor of the OWNER at reasonable times and locations for purposes of monitoring compliance with this Contract.

13. LABOR DISPUTES

The CONTRACTOR/Subcontractor shall immediately notify the Wage & Hour Monitor or his designated representative of any actual or impending CONTRACTOR/Subcontractor labor dispute which may affect, or is affecting, the Project Performance Schedule of the CONTRACTOR's or any Subcontractor's Work. In addition, the CONTRACTOR/Subcontractor shall consider all appropriate measures to eliminate or minimize the effect of such labor disputes on the Project Progress Schedule, including but not limited to such measures as: promptly seeking injunctive relief if appropriate; seeking appropriate legal or equitable actions or remedies; taking such measures as establishing a reserved gate, as appropriate; if reasonably feasible, seeking other sources of supply or service; and any other measures that may be appropriately utilized to mitigate or eliminate the adverse Project jobsite and scheduling effects of the labor dispute.

14. COMPLAINTS, PROCEEDINGS, OR TESTIMONY BY EMPLOYEES

No laborers/mechanics to whom the wage, salary, or other labor standard provisions of this Contract are applicable shall be discharged, or in any other manner discriminated against by the CONTRACTOR/Subcontractors, because such employee has filed any formal inquiry or complaint, or instituted or caused to be instituted, any legal or equitable proceeding, or has testified, or is about to testify, in any such proceeding under or relating to the wage and labor standards applicable under this Contract.

15. EMPLOYEE INTERVIEWS TO ASSURE WAGE AND LABOR STANDARD COMPLIANCE

CONTRACTOR/Subcontractors shall allow expeditious jobsite entry of the Wage & Hour Monitor displaying and presenting proper OWNER identification credentials to the jobsite superintendent or his representative. While on the jobsite, the Wage & Hour Monitor shall observe all CONTRACTOR jobsite rules and regulations concerning safety, internal security and fire prevention. CONTRACTOR/Subcontractors shall allow Project employees to be separately and confidentially interviewed at random for a reasonable duration of time by the Wage & Hour Monitor to facilitate compliance determinations regarding adherence by the CONTRACTOR/Subcontractor to these Wage and Labor Standard Provisions.

16. "ANTI-KICKBACK" PROVISION

No person employed in the construction or repair of any OWNER public works Project shall be induced, by any means, to give up to any CONTRACTOR/Subcontractor or public

official or employee, any part of the hourly and/or fringe benefit compensation to which he or she is otherwise entitled.

17. "FALSE OR DECEPTIVE INFORMATION" PROVISION

Any person employed by the CONTRACTOR/Subcontractor in the construction or repair of any OWNER public works Project, who is proven to have knowingly and willfully falsified, concealed or covered up by any deceptive trick, scheme, or device a material fact, or made any false, fictitious or fraudulent statement or representation, or made or used any false writing or document knowing the same to contain any false, fictitious or fraudulent statement or entry, shall be permanently removed from the Project jobsite by the CONTRACTOR/Subcontractor. The OWNER reserves the right to terminate this Contract for cause as a result of serious and uncured violations of this provision.

18. EMPLOYMENT OF APPRENTICES/TRAINEES

- a. Apprentices will be permitted to work at less than the predetermined rate for the Work they perform when they are employed and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship & Training, or with a Texas Apprenticeship Agency recognized by the Bureau, or if a person is employed in his first ninety (90) Calendar Days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship & Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen in any craft classification shall not be greater than the ratio under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not a trainee as defined in (b) below, or is not registered or otherwise employed as stated above, shall be paid the wage rate for the classification of Work he actually performs. The CONTRACTOR/Subcontractor is required to furnish to the Wage & Hour Monitor of the OWNER, a copy of the certification, along with the payroll record that the employee is first listed on. The wage rate paid apprentices shall be not less than the specified rate in the registered program for the apprentice's level of progress expressed as the appropriate percentage of the journeyman's rate contained in the applicable wage determination decision.
- b. Trainees will be permitted to work at less than the predetermined rate for the Work performed when they are employed pursuant to an individually registered program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen shall not be greater than that permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress. Any employee listed on the payroll at a trainee wage rate, who is not registered and participating in a training plan approved by the Employment and Training Administration, shall be paid not less than the wage rate determined by the classification of Work he actually performs. The

CONTRACTOR/Subcontractor is required to furnish a copy of the trainee program certification, registration of employee-trainees, ratios and wage rates prescribed in the program, along with the payroll record that the employee is first listed on, to the Wage & Hour Monitor of the OWNER. In the event the Employment and Training Administration withdraws approval of a training program, the CONTRACTOR/Subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the Work performed until an acceptable program is approved by the Employment and Training Administration.

- c. Paragraphs 18.a. and b. above shall not operate to exclude training programs approved by the OFCCP, United States Department of Labor and as adopted by the Associated General Contractors (AGC) of Texas, Highway, Heavy, Utilities and Industrial Branch. Guidelines for these training programs shall be the same as those established for federally funded projects. This sub-paragraph 15.c. shall not apply to those portions of a project deemed to be building construction.

d. **RATIOS, APPRENTICE TO JOURNEYMAN:**

The Ratio of Apprentice to Journeyman for this Project shall be the same as the Ratio permitted under the plan approved by the Employment and Training Administration, Bureau of Apprenticeship and Training, U.S. Department of Labor, by craft. A copy of the allowable Ratios is included with the applicable Wage Determination Decision at the end of this Supplementary Conditions Section 1.

When a "full investigation" (as called for in, and as construed under Article 5159a, Sec. 2), evidences a violation of the Apprentice or Trainee to Journeyman ratios effective for CONTRACTOR/Subcontractor employees working on this Contract, the OWNER, in addition to such other rights as may be afforded it under Texas and/or federal law and/or other sections of this Contract (especially paragraph 10 Underpayment of Wages), shall withhold from the CONTRACTOR, out of any payments (interim progress and/or final) due the CONTRACTOR, the liquidated damages (not a penalty) sum of seventy-five dollars (\$75.00) for each Calendar Day, or portion thereof, for each certified Apprentice or Trainee employee assigned to a Journeyman that exceeds the maximum allowable Apprentice/Trainee to Journeyman ratio stipulated for any Work done under this Contract, whether by the CONTRACTOR himself, or by any Subcontractor working under him.

19. JOBSITE CONDITIONS

CONTRACTORS/Subcontractors will not allow any person employed for the Project to work in surroundings or under construction conditions which are unsanitary, unhealthy, hazardous, or dangerous as governed by industry standards and appropriate local, Texas and federal statutes, ordinances, and regulatory guidelines.

20. EMPLOYMENT OF CERTAIN PERSONS PROHIBITED

- a. The CONTRACTOR/Subcontractor shall knowingly only employ persons of appropriate ages commensurate with the degree of required skill, strength, maturity and judgment associated with the activity to be engaged in, but not less than the age of fourteen (14) years, as governed by Chapter 51 "Employment of Children", Texas Labor Code, (Vernon's Texas Codes Annotated) (as may be amended), and Texas Department of Labor and Standards rulings and interpretations associated with that statute. It is hereby noted that in some circumstances generally governed by this paragraph, a federal statute (see: Fair Labor Standards Act, 29 USCS Section 212; Volume 6A of the Bureau of National Affairs Wage Hour Manual at Paragraph 96:1; "Child Labor Requirements in Nonagricultural Occupations" WH Publication 1330, July 1978 as may be amended), could pre-empt the Texas Statute and therefore be the controlling law on this subject. The CONTRACTOR/Subcontractor should seek clarification from Texas and federal agencies and legal counsel when hiring adolescent employees for particular job classifications.
- b. Prohibited persons not to be employed are also those persons who, at the time of employment for this Contract, are serving sentence in a penal or correctional institution, except that prior approval by the Wage & Hour Monitor is required to employ any person participating in a supervised work release or furlough program that is sanctioned by appropriate Texas or federal correctional agencies.
- c. The CONTRACTOR/Subcontractors shall be responsible for compliance with the provisions of the "Immigration Reform and Control Act of 1986" Public Law 99-603, and any related Texas enabling or implementing statutes, especially as they apply in combination to the unlawful employment of aliens and unfair immigration-related employment practices affecting this Contract.

21. PROVISIONS TO BE INCLUDED IN SUBCONTRACTS

The CONTRACTOR shall cause these Wage and Labor Standard Provisions, or reasonably similar contextual adaptations hereof, and any other appropriate Texas and federal labor provisions, to be inserted (or referenced by "flow down" provisions) in all subcontracts relative to the Work to bind Subcontractors (and any sub-tier subcontractors) to the same Wage and Labor Standards as contained in these Supplementary Conditions and other Contract Documents insofar as applicable to the Work of Subcontractors or sub-tier subcontractors, and to give the CONTRACTOR similar, if not greater, general contractual authority over the Subcontractor, or sub-tier subcontractors, as the OWNER may exercise over the CONTRACTOR.

General Decision Number: TX20230003 01/06/2023

Superseded General Decision Number: TX20220003

State: Texas

Construction Types: Heavy and Highway

Counties: Cameron, Hidalgo and Webb Counties in Texas.

HEAVY & HIGHWAY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022, Executive Order 14026 generally applies to the contract. The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022, Executive Order 13658 generally applies to the contract. The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/06/2023
SUTX2011-003	08/02/2011

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER (Paving & Structures).....	\$ 12.46	**
FORM BUILDER/FORM SETTER (Structures).....	\$ 12.30	**
FORM SETTER (Paving & Curb).....	\$ 12.16	**
LABORER		
Asphalt Raker.....	\$ 10.61	**
Flagger.....	\$ 9.10	**
Laborer, Common.....	\$ 9.86	**
Laborer, Utility.....	\$ 11.53	**
Pipelayer.....	\$ 11.87	**
Work Zone Barricade Servicer.....	\$ 12.88	**
POWER EQUIPMENT OPERATOR:		
Asphalt Distributor.....	\$ 13.48	**
Asphalt Paving Machine.....	\$ 12.25	**
Broom or Sweeper.....	\$ 10.33	**
Crane, Lattice Boom 80 Tons or Less.....	\$ 14.39	**
Crawler Tractor.....	\$ 16.63	
Excavator, 50,000 lbs or less.....	\$ 12.56	**
Excavator, over 50,000 lbs.....	\$ 15.23	**
Foundation Drill, Truck Mounted.....	\$ 16.86	
Front End Loader Operator, Over 3 CY.....	\$ 13.69	**
Front End Loader, 3 CY or less.....	\$ 13.49	**
Loader/Backhoe.....	\$ 12.77	**
Mechanic.....	\$ 15.47	**
Milling Machine.....	\$ 14.64	**
Motor Grader Operator, Rough.....	\$ 14.62	**
Motor Grader, Fine Grade.....	\$ 16.52	
Scraper.....	\$ 11.07	**
Servicer.....	\$ 12.34	**
Steel Worker (Reinforcing).....	\$ 14.07	**

TRUCK DRIVER

Lowboy-Float.....\$ 13.63 **
 Single Axle.....\$ 10.82 **
 Single or Tandem Axle Dump.....\$ 14.53 **
 Tandem Axle Tractor with
 Semi Trailer.....\$ 12.12 **

WELDER.....\$ 14.02 **

 WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.
 =====

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$16.20) or 13658 (\$12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year.

Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

 The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four-letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

PART II – TECHNICAL SPECIFICATIONS

SECTION 01330
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Requirements and procedures for Submittals to confirm compliance with Contract Documents.

1.02 GENERAL INSTRUCTIONS

- A. Contractor is responsible to determine and verify field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, and check and coordinate each item with other applicable approved Shop Drawings and Contract Document requirements.
- B. Provide Submittals:
 - 1. That are specified or reasonably required for construction, operation, and maintenance of the Work.
 - 2. That demonstrate compliance with the Contract Documents.
- C. Where multiple Submittals are required, provide a separate Submittal for each Specification section.
 - 1. In order to expedite construction, the Contractor may make more than one Submittal per Specification section, but a single Submittal may not cover more than one Specification section:
 - a. The only exception to this requirement is when one Specification section covers the requirements for a component of equipment specified in another section.
 - b. For example, circuit breakers are a component of switchgear. The switchgear Submittal must also contain data for the associated circuit breakers, even though they are covered in a different Specification section.
- D. Prepare Submittals in the English language. Do not include information in other languages.
- E. Present measurements in customary American units (feet, inches, pounds, etc.).
- F. Must be clear and legible, and of sufficient size for presentation of information.
- G. Page size, other than drawings:
 - 1. Minimum: 8 1/2 inches by 11 inches.
 - 2. Maximum: 11 inches by 17 inches.

- H. Drawing sheet size:
 - 1. Maximum: 22 inches by 34 inches.
 - a. Minimum plan scale: 1/8 inch equals 1 foot-0 inches.
 - b. Minimum font size: 1/8-inch.
 - 2. 11-inch by 17-inch sheet:
 - a. Minimum plan scale: 1/8 inch equals 1 foot-0 inches.
 - b. Minimum font size: 1/8-inch.
- I. Show dimensions, construction details, wiring diagrams, controls, manufacturers, catalog numbers, and all other pertinent details.
- J. Provide Submittal information from only one manufacturer for a specified product. Submittals with multiple manufacturers for one product will be rejected without review.

1.03 SUBMITTAL ORGANIZATION

- A. Organize Submittals in exactly the same order as the items are referenced, listed, and/or organized in the Specification section.
- B. For Submittals that cover multiple devices used in different areas under the same Specification section, the Submittal for the individual devices must list the area where the device is used.
- C. Bookmarks:
 - 1. Bookmarks shall match the table of contents.
 - 2. Bookmark each section (tab) and heading.
 - 3. Drawings: Bookmark at a minimum, each discipline, area designation, or appropriate division.
 - 4. At file opening, display all levels of bookmarks as expanded.
- D. Where applicable (i.e., except for Drawings, figures, etc.), Submittal content shall be electronically searchable utilizing the PDF file as submitted.
- E. Thumbnails optimized for fast web viewing.
- F. Sequentially number pages within the tabbed sections:
 - 1. Submittals that are not fully indexed and tabbed with sequentially numbered pages, or are otherwise unacceptable, will be returned without review.
- G. Attachments:
 - 1. Include with each Submittal a copy of the relevant Specification section.
 - a. Indicate in the left margin, next to each pertinent paragraph, either compliance with a check (√) or deviation with a consecutive number (1, 2, 3).
 - b. Provide a list of all numbered deviations with a clear explanation and reason for the deviation.
 - 2. Include with each Submittal a copy of the relevant Drawing, including relevant addendum updates.
 - a. Indicate either compliance with a check (√) or deviation with a consecutive number (1, 2, 3).

- b. Provide a list of all numbered deviations with a clear explanation and reason for the deviation.
 - c. Provide field dimensions and relationship to adjacent or critical features of the Work or materials.

- H. Contractor: Prepare Submittal information in sufficient detail to show compliance with specified requirements.
 - 1. Determine and verify quantities, field dimensions, product dimensions, specified design and performance criteria, materials, catalog numbers, and similar data.
 - 2. Coordinate Submittal with other Submittals and with the requirements of the Contract Documents.
 - 3. Check, verify, and revise Submittals as necessary to bring them into conformance with Contract Documents and actual field conditions.

- I. Contractor: Prepare "Or Equal" Submittal information.
 - 1. Provide standard Submittal requirements.
 - a. In addition, provide in sufficient detail to show reason for variance from specified product and impacts.
 - 2. Provide reason the specified product is not being provided.
 - 3. Explain the benefits to the Owner for accepting the "Or Equal".
 - 4. Itemized comparison of the proposed "Or Equal" with product specified including a list of significant variations:
 - a. Design features.
 - b. Design dimensions.
 - c. Installation requirements.
 - d. Operations and maintenance requirements.
 - e. Availability of maintenance services and sources of replacement materials.
 - 5. Reference projects where the product has been successfully used:
 - a. Name and address of project.
 - b. Year of installation.
 - c. Year placed in operation.
 - d. Name of product installed.
 - e. Point of contact: Name and phone number.
 - 6. Define impacts:
 - a. Impacts to other contracts.
 - b. Impacts to other work or products.
 - 7. Contractor represents the following:
 - a. Contractor bears the burden of proof of the equivalency of the proposed "Or Equal".
 - b. Proposed "Or Equal" is equal or superior to the specified product.
 - c. Contractor will provide the warranties or bonds that would be provided on the specified product on the proposed "Or Equal", unless Owner requires a Special Warranty.
 - d. Contractor will coordinate installation of accepted "Or Equal" into the Work and will be responsible for the costs to make changes as required to the Work.
 - e. Contractor waives rights to claim additional costs caused by proposed "Or Equal" which may subsequently become apparent.

- J. Contractor: Prepare substitution Submittal information.

1. Provide standard Submittal requirements.
 - a. In addition, provide in sufficient detail to show reason for variance from specified product and impacts.
2. Provide reason the specified product is not being provided.
3. Explain the benefits to the Owner for accepting the substitution.
4. Itemized comparison of the proposed substitution with product specified including a list of significant variations:
 - a. Design features.
 - b. Design dimensions.
 - c. Installation requirements.
 - d. Operations and maintenance requirements.
 - e. Availability of maintenance services and sources of replacement materials.
5. Reference projects where the product has been successfully used:
 - a. Name and address of project.
 - b. Year of installation.
 - c. Year placed in operation.
 - d. Name of product installed.
 - e. Point of contact: Name and phone number.
6. Define impacts:
 - a. Impacts to Contract Price.
 - 1) Required license fees or royalties.
 - 2) Do not include costs under separate contracts.
 - 3) Do not include Engineer's costs for redesign or revision of Contract Documents.
 - b. Impacts to Contract Time.
 - c. Impacts to Contract Scope.
 - d. Impacts to other contracts.
 - e. Impacts to other work or products.
7. Contractor represents the following:
 - a. Contractor shall pay associated costs for the Engineer to evaluate the substitution.
 - b. Contractor bears the burden of proof of the equivalency of the proposed substitution.
 - c. Proposed substitution does not change the design intent and will have equal performance to the specified product.
 - d. Proposed substitution is equal or superior to the specified product.
 - e. Contractor will provide the warranties or bonds that would be provided on the specified product on the proposed substitution, unless Owner requires a Special Warranty.
 - f. Contractor will coordinate installation of accepted substitution into the Work and will be responsible for the costs to make changes as required to the Work.
 - g. Contractor waives rights to claim additional costs caused by proposed substitution which may subsequently become apparent.

1.04 SUBMITTAL IDENTIFICATION NUMBERING

- A. Number each Submittal using a sequential numbering sequence. All Submittals must be assigned to a Specification section.

B. Number each Submittal using the format defined in the table below:

	Spec Section Number	Dash	Initial Submittal - Sequential Number	Decimal Point	Subsequent Submittal Revisions Sequential Number
<i>Example 1 Description</i>	<i>Cast-In-Place Concrete</i>		<i>8th initial Submittal</i>		
	03300	-	0008		
<i>Example 2 Description</i>	<i>Cast-In-Place Concrete</i>		<i>8th initial Submittal</i>		<i>First revision to the 8th initial Submittal</i>
	03300	-	0008	.	1

1.05 SUBMITTALS IN ELECTRONIC MEDIA FORMAT

- A. General: Provide all information in PC-compatible format using Windows® operating system as utilized by the Owner and Engineer.
- B. Text: Provide text documents and manufacturer's literature in Portable Document Format (PDF).
- C. Graphics: Provide graphic Submittals (Drawings, diagrams, figures, etc.) utilizing Portable Document Format (PDF).

1.06 SUBMITTAL PROCEDURE

- A. Engineer: Review Submittal and provide response:
 - 1. Review description:
 - a. Engineer will be entitled to rely upon the accuracy or completeness of designs, calculations, or certifications made by licensed professionals accompanying a particular Submittal whether or not a stamp or seal is required by Contract Documents or Laws and Regulations.
 - b. Engineer's review of Submittals shall not release the Contractor from Contractor's responsibility for performance of requirements of Contract Documents. Neither shall the Engineer's review release the Contractor from fulfilling purpose of installation nor from the Contractor's liability to replace defective work.
 - c. Engineer's review of Shop Drawings, samples, or test procedures will be only for conformance with design concepts and for compliance with information given in Contract Documents.
 - d. Engineer's review does not extend to:
 - 1) Accuracy of dimensions, quantities, or performance of equipment and systems designed by the Contractor.
 - 2) Contractor's means, methods, techniques, sequences, or procedures, except when specified, **indicated on the Drawings**, or required by Contract Documents.
 - 3) Safety precautions or programs related to safety which shall remain the sole responsibility of the Contractor.

- e. Engineer can Approve or Not Approve any exception at their sole discretion.
- 2. Review timeframe:
 - a. Except as may be provided in technical Specifications, a Submittal will be returned within 30 days.
 - b. When a Submittal cannot be returned within the specified period, Engineer will, within a reasonable time after receipt of the Submittal, give notice of the date by which that Submittal will be returned.
 - c. Engineer's acceptance of progress schedule containing Submittal review times less than those specified or agreed to in writing by the Engineer will not constitute Engineer's acceptance of review times.
 - d. Critical Submittals:
 - 1) Contractor will notify Engineer in writing that timely review of a Submittal is critical to the progress of Work.
- 3. Schedule delays:
 - a. No adjustment of Contract Times or Contract Price will be allowed due to Engineer's review of Submittals unless all of the following criteria are met:
 - 1) Engineer has failed to review and return first submission within the agreed upon time frame.
 - 2) Contractor demonstrates that delay in progress of Work is directly attributable to Engineer's failure to return Submittal within time indicated and accepted by Engineer.
- 4. Review response will be returned to the Contractor with one of the following dispositions:
 - a. Approved:
 - 1) No Exceptions:
 - a) There are no notations or comments on the Submittal and the Contractor may release the equipment for production.
 - 2) Make Corrections Noted - See Comments:
 - a) The Contractor may proceed with the Work, however, all notations and comments must be incorporated into the final product.
 - b) Resubmittal not required.
 - 3) Make Corrections Noted - Confirm:
 - a) The Contractor may proceed with the Work, however, all notations and comments must be incorporated into the final product.
 - b) Submit confirmation specifically addressing each notation or comment to the Engineer within 15 calendar days of the date of the Engineer's transmittal requiring the confirmation.
 - b. Not Approved:
 - 1) Correct and Resubmit:
 - a) Contractor may not proceed with the Work described in the Submittal.
 - b) Contractor assumes responsibility for proceeding without approval.
 - c) Resubmittal of complete Submittal package is required within 30 calendar days of the date of the Engineer's Submittal review response.
 - 2) Rejected - See Remarks:

- a) Contractor may not proceed with the Work described in the Submittal.
 - b) The Submittal does not meet the intent of the Contract Documents. Resubmittal of complete Submittal package is required with materials, equipment, methods, etc., that meet the requirements of the Contract Documents.
 - c. Receipt Acknowledged:
 - 1) Filed for Record:
 - a) This is used in acknowledging receipt of informational Submittals that address means and methods of construction such as schedules and work plans, conformance test reports, health and safety plans, etc.
 - 2) With Comments - Resubmit:
 - a) This is used in acknowledging receipt of informational Submittals that address means and methods of construction such as schedules and work plans, conformance test reports, health and safety plans, etc. Feedback regarding missing information, conflicting information, or other information that makes it incomplete can be made with comments.
- B. Contractor: Prepare resubmittal, if applicable:
1. Clearly identify each correction or change made.
 2. Include a response in writing to each of the Engineer's comments or questions for Submittal packages that are resubmitted in the order that the comments or questions were presented from the first and subsequent Submittals and numbered consistent with the Engineer's numbering.
 - a. Acceptable responses to Engineer's comments are listed below:
 - 1) "Incorporated" - Engineer's comment or change is accepted and appropriate changes are made.
 - 2) "Response" - Engineer's comment not incorporated. Explain why comment is not accepted or requested change is not made. Explain how requirement will be satisfied in lieu of comment or change requested by the Engineer.
 - b. Reviews and resubmittals:
 - 1) Contractor shall provide resubmittals which include responses to all Submittal review comments separately and at a level of detail commensurate with each comment.
 - 2) Contractor responses shall indicate how the Contractor resolved the issue pertaining to each review comment
 - a) Responses such as "acknowledged" or "noted" are not acceptable.
 - 3) Resubmittals which do not comply with this requirement may be rejected and returned without review.
 - 4) Contractor shall be allowed no extensions of any kind to any part of their contract due to the rejection of non-compliant Submittals.
 - 5) Submittal review comments not addressed by the Contractor in resubmittals shall continue to apply whether restated or not in subsequent reviews until adequately addressed by the Contractor to the satisfaction of the reviewing and approving authority.
 - c. Any resubmittal that does not contain responses to the Engineer's previous comments shall be returned for revision and resubmittal. No further review

by the Engineer will be performed until a response for previous comments has been received.

3. Resubmittal timeframe:
 - a. Contractor shall provide resubmittal within 15 days.
 - b. When a resubmittal cannot be returned within the specified period, Contractor shall notify the Engineer in writing.
4. Review costs:
 - a. Costs incurred by the Owner as a result of additional reviews of a particular Submittal after the second time it has been reviewed shall be borne by the Contractor.
 - b. Reimbursement to the Owner will be made by deducting such costs from the Contractor's subsequent progress payments.

1.07 PRODUCT DATA

- A. Edit Submittals so that the Submittal specifically applies to only the product furnished.
- B. Neatly cross out all extraneous text, options, models, etc., that do not apply to the product being furnished so that the information remaining is only applicable to the product being furnished.

1.08 SHOP DRAWINGS

- A. Contractor to field verify elevation, coordinates, and pipe material for pipe tie-in to pipeline or structure prior to the preparation of Shop Drawings.
- B. Indicate Project-designated equipment tag numbers for Submittal of devices, equipment, and assemblies.

1.09 SAMPLES

- A. Details:
 1. Submit labeled samples.
 2. Samples will not be returned.
 3. Provide number of sample Submittals as below:
 - a. Total: 2 minimum.
 - 1) Owner: 1 .
 - 2) Engineer: 1 .
 - 3) Contractor: None.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

ATTACHMENT A - CONTRACTOR SUBMITTAL TRANSMITTAL FORM

CONTRACTOR SUBMITTAL TRANSMITTAL FORM

Owner:	Click here to enter text.	Date:	MM/DD/YYYY
Contractor:	Click here to enter text.	Project No.:	XXXXX.XX
Project Name:	Click here to enter text.	Submittal Number:	000
Submittal Title:	Click here to enter text.		
To:	Click here to enter text.		
From:	Click here to enter text.	Click here to enter text.	
	Click here to enter text.	Click here to enter text.	

Specification No. and Subject of Submittal/Equipment Supplier			
Spec ##:	Spec ##.	Subject:	Click here to enter text.
Authored By:	Click here to enter text.	Date Submitted:	XX/XX/XXXX

Submittal Certification					
Check Either (A) or (B):					
<input type="checkbox"/>	(A) We have verified that the equipment or material contained in this Submittal meets all the requirements specified in the project manual or shown on the Contract Drawings with no exceptions.				
<input type="checkbox"/>	(B) We have verified that the equipment or material contained in this Submittal meets all the requirements specified in the project manual or shown on the Contract Drawings, except for the deviations listed.				
Certification Statement: By this Submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, and I have checked and coordinated each item with other applicable approved Shop Drawings and all Contract requirements.					
General Contractor's Reviewer's Signature:					
Printed Name:					
In the event Contractor believes the Submittal response does or will cause a change to the requirements of the Contract, Contractor shall immediately give written notice stating that Contractor considers the response to be a Change Order.					
Firm:	Click here to enter text.	Signature:	Click here to enter text.	Date Returned:	XX/XX/XXXX

PM/CM Office Use	
Date Received GC to PM/CM:	Click here to enter text.
Date Received PM/CM to Reviewer:	Click here to enter text.
Date Received Reviewer to PM/CM:	Click here to enter text.
Date Sent PM/CM to GC:	Click here to enter text.

SECTION 01357

DELEGATED DESIGN PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Delegated Design procedures.

1.02 GENERAL

- A. Delegated Design - Professional design services assigned to the Contractor by express delegation in the Contract Documents. Work is "Delegated Design" where the Technical Sections require the Contractor to provide professional design services and to submit signed and sealed documents from a registered Professional Engineer.
- B. Contractor's Professional Engineer - The design professional retained by the Contractor to perform Delegated Design.
- C. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents.
 - 1. Requirements of Delegated Design component as specified in the Technical Section and as indicated on the Drawings.
 - 2. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that the Contractor must furnish to the Engineer with respect to the Delegated Design.
- D. Contractor shall cause such Delegated Design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal shall appear on Drawings, calculations, Specifications, certifications, and Submittals prepared by such design professional.
 - 1. Contractor shall not be responsible for the adequacy of performance or design criteria specified by the Owner or Engineer.
 - 2. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.
 - 3. Such design professional shall issue certifications of design required by Laws and Regulations.
 - 4. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by the Contractor, a Subcontractor, or others for submittal to the Engineer, then such Shop Drawing or other Submittal shall bear the written approval of Contractor's design professional when submitted by the Contractor to the Engineer.

- E. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under Delegated Design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- F. Engineer's review, approval, and other determinations regarding design drawings, calculations, Specifications, certifications, and other Submittals furnished by Contractor pursuant to a Delegated Design will be only for the following limited purposes:
 - 1. Confirming that Submittal is in conformance with the performance and design criteria specified in the Contract Documents.

1.03 CONTRACTOR'S PROFESSIONAL ENGINEER

- A. Contractor or Subcontractor shall retain a licensed Professional Engineer to perform Delegated Design.
- B. Qualifications:
 - 1. Holding a current license to perform the specified design in the same jurisdiction as the Project site.
 - 2. Experienced in designing similar systems of similar complexity.
- C. Insurance:
 - 1. Provide Contractor's Professional Engineer's Professional Liability Insurance as specified Section 00800 - Supplementary Conditions.
- D. Responsibilities:
 - 1. Review and design in accordance with system performance and design criteria stated in the Contract Documents.
 - a. Prepare written requests for clarifications or interpretations of performance or design criteria for submittal to the Engineer by the Contractor.
 - 2. Sign and seal design reports, calculations, design drawings and specifications, and other design Submittals for the Delegated Design Work.
 - 3. Review and submit written approval of Submittals related to the Delegated Design Work.
 - 4. Design modifications to the Delegated Design Work as required.
 - 5. Visit the Site, as required, to verify that installation of the Delegated Design Work is in conformance with the Delegated Design Drawings and Specifications.
 - 6. Submit through Contractor to Engineer written, signed, and sealed certification that the installed Delegated Design Work complies with Contractor's Professional Engineer's design.

1.04 SUBMITTALS

- A. Prior to the start of Delegated Design:
 - 1. Contractor's Professional Engineer's qualifications:
 - a. Experience for the Delegated Design.
 - b. Evidence of Professional Engineering license.
 - 2. Contractor's Professional Engineer Professional Liability Insurance certificate.

- B. Delegated Design:
 - 1. Product data:
 - a. Details related to the Delegated Design as specified in Technical Sections to completely describe the system.
 - 2. Design documents with signature and seal from the Contractor's Professional Engineer.
 - a. Design documents include but are not limited to Drawings, calculations, Specifications, inspection reports, and certifications.
 - 3. Lists and schedules:
 - a. Prepare and submit lists or schedules of items where Delegated Design is required by the Contract Documents.
 - b. Group items by location in the Work.
 - 1) When "Area Numbers" are indicated on the Contract Drawings, group lists in accordance with those "areas."
 - 2) For work without area numbers, group using logical divisions acceptable to the Engineer.
 - 3) Group items within each "area" as follows:
 - a) Systems.
 - b) Components.
 - c) Supports.
 - d) Anchorage.
 - e) Bracing.
- C. Construction services:
 - 1. Contractor's Professional Engineer's comments on Submittals.
 - 2. Other construction documents, as required.

1.05 ENGINEER RESPONSE TO DELEGATED DESIGN SUBMITTALS

- A. Engineer response will be either of the following:
 - 1. Approved. Make Corrections Noted - See Comments:
 - a. Contractor may proceed with the Work; however, all notations and comments must be incorporated into the final product.
 - b. Review was for the limited purpose of determining that the document was stamped by a Professional Engineer and that such design is generally consistent with and will not negatively affect the design concept presented in the Contract Documents.
 - 2. Rejected - See Remarks:
 - a. Contractor may not proceed with the Work described in the Submittal.
 - b. Submittal does not meet the intent of the Contract Documents.
 - c. Resubmittal of complete Submittal package is required with materials, equipment, methods, etc., that meet the requirements of the Contract Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01410
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Regulatory authorities and codes.

1.02 AUTHORITIES HAVING JURISDICTION (AHJ)

- A. Also referred to as the permitting agency.
- B. Building Department:

1.03 APPLICABLE CODES

- A. International Code Council (ICC).
1. Building code:
 - a. International Building Code (IBC), 2018.
 2. Electrical code:
 - a. National Fire Protection Association (NFPA), NFPA 70: National Electrical Code (NEC), 2017.
 3. Energy code:
 - a. International Energy Conservation Code (IECC), 2018.
 4. Fire code:
 - a. International Fire Code (IFC), 2018.
 5. Fuel gas code:
 - a. International Fuel Gas Code (IFGC) –2018.
 6. Mechanical code:
 - a. International Mechanical Code (IMC), 2018.
 7. Plumbing code:
 - a. International Plumbing Code (IPC), 2018.
- B. Products in contact with drinking water
1. Materials in contact with drinking waters: In accordance with NSF 61 and NSF 372.
 - a. Certification by an independent ANSI accredited third party, including, but not limited to, NSF International, as being lead free.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01450
QUALITY CONTROL

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Quality control and control of installation.
 - 2. Tolerances.
 - 3. References.
 - 4. Mock-up requirements.
 - 5. Authority and duties of Owner's representative or inspector.
 - 6. Sampling and testing.
 - 7. Testing and inspection services.
 - 8. Contractor's responsibilities.

1.02 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. When manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
- H. When specified, products will be tested and inspected either at point of origin or at Work site:
 - 1. Notify Engineer in writing well in advance of when products will be ready for testing and inspection at point of origin.
 - 2. Do not construe that satisfactory tests and inspections at point of origin is final acceptance of products. Satisfactory tests or inspections at point of origin do not preclude retesting or re-inspection at Work site.
- I. Do not ship products which require testing and inspection at point of origin prior to testing and inspection.

1.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. When Manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.04 REFERENCES

- A. ASTM International (ASTM):
 - 1. E329 - Standard for Agencies Engaged in Construction Inspection, Testing or Special Inspection.
- B. National Institute of Standards and Technology (NIST).

1.05 PRODUCT REQUIREMENTS

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. When specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

1.06 MOCK-UP REQUIREMENTS

- A. Tests will be performed under provisions identified in this Section and identified in respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be comparison standard for remaining Work.
- D. Where mock-up has been accepted by Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so by Engineer.

1.07 AUTHORITY AND DUTIES OF OWNER'S REPRESENTATIVE OR INSPECTOR

- A. Owner's Project Representative employed or retained by Owner is authorized to inspect the Work.

- B. Inspections may extend to entire or part of the Work and to preparation, fabrication, and manufacture of products for the Work.
- C. Deficiencies or defects in the Work which have been observed will be called to Contractor's attention.
- D. Inspector will not:
 - 1. Alter or waive provisions of Contract Documents.
 - 2. Inspect Contractor's means, methods, techniques, sequences, or procedures for construction.
 - 3. Accept portions of the Work, issue instructions contrary to intent of Contract Documents, or act as foreman for Contractor. Supervise, control, or direct Contractor's safety precautions or programs; or inspect for safety conditions on Work site, or of persons thereon, whether Contractor's employees or others.
- E. Inspector will:
 - 1. Conduct on-site observations of the Work in progress to assist Engineer in determining when the Work is, in general, proceeding in accordance with Contract Documents.
 - 2. Report to Engineer whenever Inspector believes that Work is faulty, defective, does not conform to Contract Documents, or has been damaged; or whenever there is defective material or equipment; or whenever Inspector believes the Work should be uncovered for observation or requires special procedures.

1.08 SAMPLING AND TESTING

- A. General:
 - 1. Prior to delivery and incorporation in the Work, submit listing of sources of materials, when specified in sections where materials are specified.
 - 2. When specified in sections where products are specified:
 - a. Submit sufficient quantities of representative samples of character and quality required of materials to be used in the Work for testing or examination.
 - b. Test materials in accordance with standards of national technical organizations.
- B. Sampling:
 - 1. Furnish specimens of materials when requested.
 - 2. Do not use materials which are required to be tested until testing indicates satisfactory compliance with specified requirements.
 - 3. Specimens of materials will be taken for testing whenever necessary to determine quality of material.
 - 4. Assist Engineer in preparation of test specimens at site of work, such as soil samples and concrete test cylinders.

1.09 TESTING AND INSPECTION SERVICES

- A. Contractor will employ and pay for specified services of an independent firm to perform Contractor quality control testing as required in the technical specifications for various work and materials.

- B. Owner will employ and pay for specified services of an “Owner’s independent testing firm” certified to perform testing and inspection as required in the technical specifications for various work and materials or stipulated in Section 01455 - Regulatory Quality Assurance to confirm Contractor’s compliance with Contract Documents.
- C. The Owner’s independent testing firm will perform tests, inspections and other services specified in individual specification sections and as required by Owner and requested by the Engineer.
- D. The qualifications of laboratory that will perform the testing, contracted by the Owner or by the Contractor, shall be as follows:
 - 1. Has authorization to operate in the state where the project is located.
 - 2. Meets “Recommended Requirements for Independent Laboratory Qualification,” published by American Council of Independent Laboratories.
 - 3. Meets requirements of ASTM E329.
 - 4. Laboratory Staff: Maintain full time specialist on staff to review services.
 - 5. Testing Equipment: Calibrated at reasonable intervals with devices of accuracy traceable to NIST or accepted values of natural physical constants.
 - 6. Will submit copy of report of inspection of facilities made by Materials Reference Laboratory of NIST during most recent tour of inspection, with memorandum of remedies of deficiencies reported by inspection.
- E. Testing, inspections, and source quality control may occur on or off project site. Perform off-site testing inspections and source quality control as required by Engineer or Owner.
- F. Contractor shall cooperate with Owner’s independent testing firm, furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify Engineer and Owner’s independent testing firm 48 hours prior to expected time for operations requiring testing.
 - 2. Make arrangements with Owner’s independent testing firm and pay for additional samples and tests required for Contractor’s use.
- G. Limitations of authority of testing Laboratory: Owner’s independent testing firm or Laboratory is not authorized to:
 - 1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency or laboratory may not approve or accept any portion of the Work.
 - 3. Agency or laboratory may not assume duties of Contractor.
 - 4. Agency or laboratory has no authority to stop the Work.
- H. Testing and employment of an Owner’s independent testing firm or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- I. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same Owner’s independent testing firm on instructions by Engineer. Payment for re-testing or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.

- J. The Owner's independent testing firm responsibilities will include:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.
 - 6. Perform additional tests required by Engineer.
 - 7. Attend preconstruction meetings and progress meetings when requested.

- K. Owner's independent testing firm individual test reports:
 - 1. After each test, Owner's independent testing firm will promptly submit electronically report to Engineer and to Contractor.
 - 2. Test reports shall include at least the following information:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in Project.
 - g. Type of inspection or test.
 - h. Date of test.
 - i. Certified test results stamped and signed by a registered Engineer in the state where the project is located.
 - j. Summary of conformance with Contract Documents.
 - k. When requested by Engineer, the Owner's independent testing firm will provide interpretation of test results.

1.10 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with Owner's independent testing firm or laboratory personnel and provide access to construction and manufacturing operations.

- B. Secure and deliver to Owner's independent testing firm or laboratory adequate quantities of representative samples of materials proposed to be used and which require testing.

- C. Provide to Owner's independent testing firm or laboratory and Engineer preliminary mix design proposed to be used for concrete, and other materials mixes which require control by testing laboratory.

- D. Submit product test reports electronically.

- E. Furnish incidental labor and facilities:
 - 1. To provide access to construction to be tested.
 - 2. To obtain and handle samples at Work site or at source of product to be tested.

3. To facilitate inspections and tests.
 4. For storage and curing of test samples.
- F. Notify Owner's independent testing firm or laboratory 48 hours in advance of when observations, inspections and testing is needed for laboratory to schedule and perform in accordance with their notice of response time.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01455

REGULATORY QUALITY ASSURANCE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Project regulatory requirements for quality assurance that includes Special Inspections, Special Certification, and Structural Observation.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. 318 - Building Code Requirements for Structural Concrete.
 - 2. 530 - Building Code Requirements for Masonry Structures.
 - 3. 530.1 - Specification for Masonry Structures.
- B. American Institute of Steel Construction (AISC):
 - 1. 360 - Specification for Structural Steel Buildings.
- C. American Society of Civil Engineers (ASCE):
 - 1. 7 - Minimum Design Loads for Buildings and Other Structures.
- D. American Welding Society (AWS):
 - 1. D1.3 - Structural Welding Code - Sheet Steel.
 - 2. D1.4 - Structural Welding Code - Reinforcing Steel.
- E. ASTM International (ASTM):
 - 1. A706 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
 - 2. C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 3. C172 - Standard Practice for Sampling Freshly Mixed Concrete.
 - 4. C1611 - Standard Test Method for Slump Flow of Self-Consolidating Concrete.
- F. Building Code:
 - 1. As specified in Section 01410 - Regulatory Requirements.
- G. The Masonry Society (TMS):
 - 1. 402 - Building Code for Masonry Structures.
 - 2. 602 - Specifications for Masonry Structures.

1.03 TERMINOLOGY

- A. The words and terms listed below are not defined terms that require initial capital letters, but, when used in this Section, have the indicated meaning.
 - 1. Special Certification: Certification for designated seismic systems that demonstrates compliance with performance requirements.

2. Special Inspection: Inspection of the materials, installation, fabrication, erection, or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards.
3. Special Inspection, Continuous: The full-time observation of work requiring Special Inspection by an approved special inspector who is present in the area where the work is being performed.
4. Special Inspection, Periodic: The part-time, or intermittent observation of work requiring Special Inspection by an approved special inspector who is present in the area where the work is being performed and at the completion of the work.
5. Structural Observation: The visual observation of the structural system by a registered design professional for general conformance to the approved construction documents at significant construction stages and at completion of the structural system.

1.04 SUBMITTALS

- A. Schedule and coordinate the submittal of Special Inspection reports and test results prepared by others.

1.05 SPECIAL INSPECTION

- A. Owner will employ 1 or more special inspectors who will provide Special Inspections during construction.
- B. Special inspector(s) shall be qualified for inspection of the particular type of materials or operations requiring Special Inspection.
- C. Testing laboratory: Testing that is required to satisfy the requirements of Special Inspection will be performed by the Owner's testing laboratory.
- D. Duties of special inspector:
 1. General: Required duties of the special inspector(s) shall be as described in the Building Code.
 2. Reporting: Special inspector(s) shall provide reports of each inspection to the Owner and shall distribute copies of inspection reports to the Engineer and Contractor as required.
 - a. Reports shall, at a minimum, include the following items:
 - 1) Date and time of inspection, and name(s) of individual(s) performing the inspection.
 - 2) Structures and areas of the structure where work or testing was observed.
 - 3) Discrepancies between the requirements of the Contract Documents and the work or testing observed.
 - 4) Other areas of deficiency in the Work.
- E. Special Inspections shall not be construed as fulfilling the requirements for Structural Observation.
- F. Owner or special inspector are responsible to select materials for Special Inspection.
 1. Contractor shall not select materials for Special Inspection.

1.06 SPECIAL CERTIFICATION

- A. Provide equipment that meets the special certification requirements of the Building Code.
- B. Designated seismic systems shall be subject to the testing and qualification requirements of the regulatory Building Code, and shall require Special Certification as set forth in ASCE 7:
 - 1. Mechanical equipment that is assigned an importance factor of 1.50 as specified in Section 01850 - Design Criteria.
 - 2. All electrical equipment.
- C. Special certification requirements for designated seismic systems:
 - 1. Submittals shall include certification that the equipment is seismically qualified. Certifications are subject to review and acceptance by Owner.
 - 2. Certifications may be at least one of the following in accordance with ASCE 7:
 - a. Analysis.
 - b. Testing.
 - c. Experience data.

1.07 STRUCTURAL OBSERVATION

- A. Owner will employ 1 or more registered design professionals to provide Structural Observation(s) during construction.
 - 1. Registered design professional will be a civil or structural engineer currently licensed as such in the state where the project is located and regularly engaged in structural design equivalent to or similar to that indicated on the Drawings.
- B. Structural Observations shall not be construed as fulfilling the requirements for Special Inspections.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SPECIAL INSPECTIONS

- A. Owner will provide Special Inspection of the following types of work as described in the Building Code wherever such work occurs, unless otherwise specified.
 - 1. Attachment A - Concrete - Special Inspection Schedule.
 - 2. Attachment B - Architectural, Mechanical, and Electrical Components - Special Inspection Schedule.
 - 3. Attachment D - Soils - Special Inspection Schedule.

3.02 SPECIAL CERTIFICATION

- A. Special inspector shall examine the designated seismic system(s) and determine whether the designated system components, including anchorage, are consistent with the evidence of compliance submitted for Special Certification.

3.03 STRUCTURAL OBSERVATION

- A. The following work requires Structural Observation in accordance with the Building Code.
 - 1. All structures in all areas:
 - a. Structural walls.
 - b. Equipment Pads and Elevated slabs.

3.04 SCHEDULE

- A. Allow time necessary for Special Inspections and Structural Observation specified in this Section.
- B. Sufficient notice shall be given so that the Special Inspections and Structural Observations can be performed. Allow time for individuals performing to travel to the site.

3.05 PROCEDURE

- A. Special inspector will immediately notify the Engineer of any corrections required and follow notification with appropriate documentation.
- B. Contractor shall not proceed until the work is satisfactory to the Engineer.

END OF SECTION

ATTACHMENT A - CONCRETE - SPECIAL INSPECTION SCHEDULE

CONCRETE - SPECIAL INSPECTION SCHEDULE

(Includes: Cast-in-place, precast, prestressed, precast-prestressed, and shotcrete.)

Verification and Inspection	Reference Standard	Frequency of Inspection ⁽¹⁾ (During Task Listed)	
		Continuous	Periodic
1. Inspect reinforcement, including prestressing tendons, and verify placement.	ACI 318 Building Code		●
2. Inspect anchors cast in concrete.	ACI 318		●
3. Inspect anchors post-installed in hardened concrete members:			
a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.	ACI 318	●	
b. Mechanical anchors and adhesive anchors not defined in 4.a.	ACI 318		●
4. Verify use of required design mix.	ACI 318 Building Code		●
5. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	ASTM C172 ASTM C31 ACI 318 Building Code	●	
6. Inspect concrete and shotcrete placement for proper application techniques.	ACI 318 Building Code	●	
7. Verify maintenance of specified curing temperature and techniques.	ACI 318 Building Code		●
8. Inspect formwork for shape, location and dimensions of the concrete member being formed.	ACI 318		●
Notes: (1) "●" represents a required inspection activity for the project where it occurs.			

**ATTACHMENT B - ARCHITECTURAL, MECHANICAL, AND ELECTRICAL COMPONENTS -
SPECIAL INSPECTION SCHEDULE**

**ARCHITECTURAL, MECHANICAL, AND ELECTRICAL COMPONENTS -
SPECIAL INSPECTION SCHEDULE**

Verification and Inspection	Reference Standard	Frequency of Inspection ⁽¹⁾ (During Task Listed)	
		Continuous	Periodic
1. Architectural components:			
a. Cladding - exterior, weighing more than 5 psf: Erection and fastening.	Building Code		●
b. Non-bearing walls - exterior: Erection and fastening.	Building Code		●
c. Non-bearing walls - interior, weighing more than 15 psf.	Building Code		●
d. Access floors: Erection and anchorage.	Building Code		●
e. Suspended ceiling system: Bracing.			●
2. Plumbing, mechanical, and electrical components:			
a. Anchorage of electrical equipment for emergency and standby power systems.	Building Code		●
b. Anchorage of other electrical and mechanical equipment over 400 lb. on floors or roofs.	Building Code		●
c. Installation and anchorage of pipelines greater than 8 inches in diameter.			●
d. Installation and anchorage of ductwork designed to carry hazardous materials.	Building Code		●
e. Installation and anchorage of ductwork greater than 6 sf in cross section.			●
f. Installation and anchorage of vibration isolation systems where Contract Documents require nominal clearance of 1/4 inch or less between the equipment support frame and its support/restraint.	Building Code		●
g. Installation of mechanical and electrical equipment, including duct work, piping systems and their structural supports, where automatic fire sprinkler systems are installed.	Building Code		●
3. Fire-resistance elements:			
a. Sprayed fire-resistant coatings:	Building Code		
b. Mastic and intumescent coatings:	Building Code		
c. Fire-resistant penetrations and joint systems:	Building Code		
4. Smoke control systems	Building Code		
<u>Notes:</u>			
(1) "●" represents a required inspection activity for the project where it occurs.			

SECTION 01850
DESIGN CRITERIA

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Design criteria for use in the selection of equipment and appurtenances specified in Technical Sections of these Specifications and indicated on the Drawings.
 - 2. Criteria for design of systems, components and equipment fabricated off site and shipped to the Work for installation.
 - 3. Criteria for design of anchors to connect equipment and appurtenances to supports and structures.

- B. The criteria in this Section apply throughout the Work, unless additional criteria, or more restrictive criteria, are indicated.
 - 1. Additional criteria and requirements relevant to specific locations, specific materials, and specific equipment are indicated on the Drawings, and in the Technical Sections.

1.02 REFERENCES

- A. American Society of Civil Engineers (ASCE):
 - 1. 7-16 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures. (ASCE 7).

- B. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):
 - 1. ASHRAE Fundamentals Handbook.

- C. International Code Council (ICC):
 - 1. International Energy Conservation Code (IECC).
 - 2. International Plumbing Code (IPC).

- D. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA):
 - 1. Seismic Restraint Manual: Guidelines for Mechanical Systems, 3rd edition 2008.

PART 2 PRODUCTS

2.01 DESIGN CRITERIA - SITE INFORMATION

- A. Site name: City of Brownville – Texas Water Purification Plant.
 - 1. Street address: As specified in Section 01110 - Summary of Work.
 - a. Coordinates (approximate): Latitude 25.926254; Longitude -97.465744.
 - 2. Site elevation (approximate):
 - a. 25.9 feet above mean sea level.

3. Groundwater elevation:
 - a. For design of buried and partially buried construction:
 - 1) Assume groundwater level approximately 2 feet below finished grade.

2.02 DESIGN CRITERIA - REGULATORY REQUIREMENTS

- A. Requirements of authorities having jurisdiction over the Project are included in Section 01410 - Regulatory Requirements.

2.03 DESIGN CRITERIA - OPERATING ENVIRONMENT

- A. Drawings and Technical Sections include additional criteria and requirements relevant to specific locations, materials, and equipment.
- B. Outdoor conditions:
 1. International Energy Conservation Code (IECC): Climate Zone 1A.
 2. Site climatic data location: Cameron County, TX, USA.
 3. Temperature criteria: As specified in the following Table: Design Temperatures - Outdoor Criteria in Accordance with ASHRAE Fundamentals Handbook.

Table: Design Temperatures - Outdoor Criteria in Accordance with ASHRAE Fundamentals Handbook	
Reference Location:	Brownsville, TX (WMO: 72250)
Condition:	Criteria
Daily mean range:	22.4 degrees Fahrenheit.
Winter:	At or above this temperature 99.6 percent of the time: 26.6 degrees Fahrenheit dry-bulb.
Summer:	At or above this temperature 0.4 percent of the time: 100.3 degrees Fahrenheit dry-bulb.

4. Rainfall intensity:
 - a. Reference: International Plumbing Code (IPC):
 - 1) 4.78 inches per hour (100-year, 1-hour rainfall).

2.04 DESIGN CRITERIA - STRUCTURAL

- A. General:
 1. Criteria for structural design of:
 - a. Equipment at locations subject to seismic events.
 - b. Equipment exposed to outdoor environments.
 - c. Equipment supports and bracing, and anchorage of such items to building and non-building structures.
 - d. Structures provided for the Work through Delegated Design.
 - e. Manufactured and prefabricated structures, and anchorage of such structures to foundations or other supporting elements.
 2. Structural design criteria used by the Engineer of record and required by the building code to be indicated on the Drawings are included on the Contract Drawing titled "General Structural Notes."

- B. Delegated Design:
 - 1. As specified in Section 01357 - Delegated Design Procedures.
 - 2. Structural engineering design shall be performed by a Civil or Structural Engineer licensed in the State of Texas.

- C. Structure risk category:
 - 1. Develop design loads and provide detailing in accordance with the provisions of ASCE 7 and the building code specified in Section 01410 - Regulatory Requirements, based on the Structure Risk Category indicated in Table: Project Structures - Risk Category and Seismic Design Information.

- D. Seismic loads:
 - 1. Seismic design parameters: Basic parameters - ASCE 7:
 - a. Ground motion MCE_R , 5 percent damped:
 - 1) Short periods, $S_s = 0.043$ g.
 - 2) 1 second period, $S_1 = 0.011$ g.
 - b. Peak ground acceleration, MCE_G :
 - 1) Peak ground acceleration, $PGA = 0.022$ g.
 - c. Mapped long-period transition period:
 - 1) $TL = 12$ seconds.
 - 2. Structures - General:
 - a. Seismic Design Category (SDC): As indicated in the following Table: Project Structures - Risk Category and Seismic Design Information.

Table: Project Structures - Risk Category and Seismic Design Information						
Description: Water Treatment Facility						
Area	Description	Risk Category	Site Class	S_{DS}	S_{D1}	Seismic Design Category⁽¹⁾
All	All water holding structures	III	D	0.038	0.015	III

Notes:

(1) Seismic Design Category for Delegated Design, and for seismic certification of electrical and mechanical equipment as required by ASCE 7.

- b. Structure response modification coefficient, R :
 - 1) In accordance with ASCE 7 and the requirements of the Technical Sections.
- 3. Structures - Tanks and vessels.
 - a. Includes: Tank structures, tank supports, and anchorage to structures or foundations.
 - b. Liquid storage structures (e.g., basins and tanks).
 - 1) Include impulsive and convective ("sloshing") effects.
 - 2) Component response modification factor - impulsive effects, R_i : In accordance with ASCE 7, Table 15.4-2.
 - 3) Component response modification factor - convective effects, $R_c = 1.0$.

- c. Dry material storage structures (e.g., silos, hoppers):
 - 1) Include effects of stored materials.
 - 2) Component response modification factor - impulsive effects, R_i : In accordance with ASCE 7, Table 15.4-2.
- 4. Non-structural components - General:
 - a. Includes:
 - 1) Mechanical and electrical equipment; anchorage of equipment to structures or supports; design of supports; and anchorage of supports to structures or foundations.
 - 2) Distribution systems associated with mechanical and electrical equipment such as piping, ductwork, conduits, cable trays, raceways, bus ducts, and similar items; anchorage of such systems to supports and structures; and bracing of such systems.
 - b. Seismic design requirements for non-structural components are based on the Seismic Design Category (SDC) of the structure or facility where the equipment is installed.
 - c. Design components, component anchorage, and component connections to piping and utilities in accordance with the requirements of ASCE 7, Table 13.2-1.
 - d. Component amplification factor (a_p), response factor (R_p), and overstrength factor for anchorage to concrete (Ω_o):
 - 1) Mechanical and electrical components and systems: In accordance with ASCE 7, Table 13.6-1, unless otherwise indicated in the Technical Sections for these items.
 - 2) Architectural components and systems: In accordance with ASCE 7, Table 13.6-1, unless otherwise indicated in the Technical Sections for these items.
 - e. Component importance factor, I_p :
 - 1) In accordance with the following Table: Component Importance Factor for Seismic Design, I_p .
 - 2) For items not listed in Table: Component Importance Factor for Seismic Design, I_p , designate importance factor in accordance with the provisions of ASCE 7, Chapter 13, and submit to the Engineer for review prior to developing calculations and details related to that component.

Table: Component Importance Factor for Seismic Design, I_p		
Structure Seismic Design Category	Components	I_p
All	Electrical: Items and distribution system components specified in Division 16 - Electrical.	1.5
All	Process Control and Instrumentation Systems: Components and distribution systems specified in Division 17 - Instrumentation and Controls.	1.5
All	Equipment and components specified in Divisions 11 through 15, <u>except</u> HVAC and plumbing components listed below.	1.5
All	All equipments.	1.0

E. Wind loads:

1. Design structures and non-structural components that are exposed to wind to withstand design wind loads.
 - a. Reduction of wind loads based on shielding effects of surrounding structures or components is not allowed.
 - b. Design for wind loading is not required for non-structural components and for non-building structures located inside enclosed buildings.
2. Design parameters:
 - a. Basic wind speed:
 - 1) 161 miles per hour (33 feet, 3 second gust).
 - b. Exposure category: C .
 - c. Topographic factor, K_{zt} : 1.0 .
 - d. Wind pressure for design of "components and cladding".
 - 1) "Components and cladding" includes doors, windows, siding panels, skylights, parapets and similar architectural elements.
 - 2) Minimum wind pressure for components and cladding, strength level:
 - a) Wall elements: Minimum 35 pounds per square foot, pressure or vacuum.
 - b) Roof elements: Minimum 60 pounds per square foot, pressure or vacuum.
 - c) For "allowable stress level" pressures, multiply strength level pressures by 0.625.

F. Snow loads:

1. Design for snow loading is not required for non-structural components and for non-building structures located inside enclosed buildings.
2. Design parameters:
 - a. Ground snow load: $p_g = 8$ pounds per square foot.
 - b. Flat roof snow load: $p_f = 8$ pounds per square foot, minimum.
 - c. Exposure factor, minimum: $I = 1.1$.
 - d. Importance factor, minimum: $I_s = 1.2$.
 - e. Drifting:
 - 1) Consider effects of adjacent and nearby structures and equipment on drift loads.
3. Ice build-up at eaves:
 - a. Minimum 100 pounds per linear foot along lower edges of roof.

- G. Rainfall loads:
 - 1. Determine rainfall loads using rainfall intensity specified in this Section, and including effects of exposed surface slope, height above surface to discharge elevation, and deflection of ponded surfaces.

- H. Operational loads:
 - 1. Loads may include equipment vibration, torque, thermal effects, effects of internal contents (weight and sloshing), surge or “water hammer,” and other load conditions.
 - 2. Design for loads indicated by equipment manufacturer.
 - 3. Design for loads indicated in the Technical Sections for equipment and appurtenances.

- I. Serviceability considerations: ASCE 7-16:
 - 1. Deflection, unless otherwise indicated on the Drawings, or specified:
 - a. Beam deflection as fraction of span:
 - 1) Walkways and platforms: Total load = $L/240$; live load = $L/360$.
 - 2) Equipment supports: $L/450$.

PART 3 EXECUTION

3.01 GENERAL

- A. Design approach and criteria in accordance with:
 - 1. Regulatory requirements, including but not limited to the building code specified in Section 01410 - Regulatory Requirements.
 - 2. Reference standards and project-specific design criteria listed in this Section.
 - 3. Specific requirements for individual elements and components of the Work as specified in subsequent Technical Sections.

- B. In the event of conflicts between design criteria, contact Engineer for interpretation.

- C. Where Owner-Delegated Design is required by the Specifications, prepare and submit designs as specified in Section 01357 - Delegated Design Procedures.

3.02 DELEGATED DESIGN

- A. Where Delegated Design is required by the Technical Sections, prepare and submit designs as specified in Section 01357 - Delegated Design Procedures.

- B. Calculations:
 - 1. Where submittal of calculations is required:
 - a. Provide complete calculations, including sketches to illustrate the design concepts being evaluated, and details to fully describe proposed construction.
 - 2. Requirements for seismic design calculations will be waived for the following:
 - a. Furniture and storage racks 6 feet in height or less.
 - b. Moveable equipment.
 - c. Mechanical and electrical equipment and components located in structures designated as Seismic Design Category A or B.

- d. Mechanical and electrical equipment and components located in structures designated as Seismic Design Category C and where the component importance factor, I_p , is equal to 1.0.
- 3. Requirements for wind design calculations will be waived for the following:
 - a. Equipment and components located inside structures, and away from the effects of wind loads.
- C. Shop Drawings:
 - 1. Describing components and manufacturer's requirements for connections.
 - a. Include details for connections of components to structures and supports.
 - b. Include details for anchoring bracing to structures where required.

3.03 DESIGN - ANCHORS FOR EQUIPMENT, COMPONENTS, AND BRACING

- A. General:
 - 1. Engineer's approval of anchor designs is required before placement of construction that supports or provides bracing for anchored equipment and components.
 - a. Prepare anchor designs after Engineer's approval of the products and layout, and before placement of concrete or masonry that supports them.
 - 2. Adjust equipment pad sizes and add additional anchor confinement reinforcing to provide required strength at anchorage points between equipment and pad, and between pad and structure.
 - 3. Supports and bracing:
 - a. Design and install braces and anchors to transfer forces from equipment and components to the lateral force resisting system of the surrounding structure.
 - b. Anchor and brace piping, ductwork, and electrical distribution components so that lateral or vertical displacement does not result in damage to or failure of essential architectural, mechanical, or electrical equipment.
 - 1) Provide supplementary framing where required to transfer forces.
 - 2) Detail and locate braces and anchors to minimize differential movements between components and structure.
- B. Preparation:
 - 1. Obtain manufacturer's information:
 - a. Weight and dimensions of components.
 - b. Layout and location of anchors that connect to equipment base plates, sole plates, skids, or pads.
 - c. Sizes of holes for anchors that will be provided in equipment bases or support frames.
- C. Analysis and design:
 - 1. Perform and submit calculations to determine anchor designs at locations where equipment and equipment supports are connected to the supporting structure.
 - a. Indicate number, size, type, and material for anchors.
 - 2. In determining forces at locations where equipment is anchored to structures, include effects of:
 - a. Equipment self-weight and operating weight.
 - b. Location of equipment center of mass.

- c. Forces from equipment operation including, but not limited to:
 - 1) Effects of internal contents including weight and sloshing.
 - 2) Effects of thrust, surge, and water hammer where specified.
 - 3) Equipment reactions and operating torque.
 - 4) Equipment vibration.
 - 5) Thermal effects from equipment and from distribution systems connected to the equipment (piping, ducts, and electrical).
 - 6) Other load or displacement inducing conditions.
- d. Forces on equipment from loads specified in this Section.
 - 1) Include effects of wind, snow, and icing loads where applicable.
 - 2) Design for load combinations indicated in ASCE 7, unless otherwise specified or indicated on the Drawings.
 - 3) Seismic and wind loads: For equipment and tanks with weight that varies based on the volume of contained material, determine anchor forces to accommodate the full range of filled, partially filled, and empty conditions.
- 3. Determine forces and overturning moments at equipment supports and at locations where supports are anchored to structures.
 - a. Indicate shear force and associated axial force at each anchor.
- 4. Do not use friction to resist sliding resulting from seismic or wind forces.
 - a. Resist sliding only by direct application of sliding loads to fasteners as bearing, shear, tension, or compression forces.
- 5. Using combined shears and axial forces at each anchor, design anchors and anchor groups for ductile failure.
 - a. Ductile failure: Anchor yield before failure of base material, typically concrete or masonry, at the anchor.
- 6. Anchor selection:
 - a. Provide anchors type indicated on the Drawings.
 - b. Where anchors are not specifically indicated on the Drawings, select in accordance with the following:
 - 1) Anchors that resist seismic and wind forces:
 - a) Cast-in-place forged hex-head anchor bolt.
 - 2) Anchors loaded in sustained tension:
 - a) Cast-in-place forged hex-head anchor bolt.
 - 3) Anchors for reciprocating, vibrating, and rotating equipment:
 - a) Cast-in-place forged hex-head anchor bolt.
 - c. Do not use post-installed anchors, mechanical or adhesive, unless:
 - 1) Post-installed anchors are indicated on the Drawings, or
 - 2) Post-installed are approved by the Engineer prior to placement of the surrounding concrete or masonry.
 - d. Anchor diameter:
 - 1) Select diameter so that hole in base plate is not greater than 125 percent of the nominal diameter of the anchor, nor greater than the diameter of the anchor plus 1/4 inch.
- 7. Determine number, size, layout, and minimum effective embedment for anchors.
 - a. Layout includes anchor spacing and required distance(s) from anchor to edge(s) of supporting concrete or masonry.
 - b. Anchors in concrete: Design based on minimum specified 28-day compressive strength, $f'c$, as follows, unless otherwise indicated on the Drawings for the Work area:
 - 1) Concrete placed for this Work: $f'c = 4000$ pounds per square inch.

- 2) Existing concrete in place prior to this Work: $f'c = 4000$ pounds per square inch.
8. Prepare Drawings showing construction details of anchor designs.
9. Submit design calculations and Drawings prior to placement of anchors, and of the structural elements to which they will connect.

END OF SECTION

SECTION 03071

EPOXIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Epoxy.
 - 2. Epoxy gel.
 - 3. Epoxy bonding agent.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. C881 - Standard Specification for Epoxy-Resin-Base Systems for Concrete.
 - 2. C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
 - 3. D638 - Standard Test Method for Tensile Properties of Plastics.
 - 4. D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
- B. NSF International (NSF):
 - 1. 61 - Drinking Water System Components - Health Effects.

1.03 SUBMITTALS

- A. General: Submit as specified in Section 01330 - Submittal Procedures.
- B. Product Data: Submit manufacturer's data completely describing epoxy materials:
 - 1. Submit evidence of conformance to ASTM C881. Include manufacturer's designations of Type Grade, Class, and Color.
 - 2. Submit documentation that materials meet or exceed the specified strength and performance characteristics. Indicate test methods and test results.
 - 3. Submit documentation confirming listing under NSF-61.
- C. Quality control Submittals:
 - 1. Manufacturer's installation instructions.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Performance requirements:
 - 1. Provide epoxy materials that are new.
 - 2. Store and use products within limitations set forth by manufacturer.
 - 3. Perform and conduct work of this Section in neat orderly manner.

2.02 MATERIALS

- A. General:
1. Moisture tolerant, water-insensitive, two-component epoxy resin adhesive material containing 100 percent solids, and meeting or exceeding the performance properties specified when tested in accordance with the standards specified.
 2. Listed under NSF-61 for use in direct contact with potable water.
- B. Epoxy: Low viscosity product in accordance with ASTM C881; Types I, II, and IV; Grade 1; Class C except as modified in this Section.
1. Manufacturers: One of the following, or equal:
 - a. Dayton Superior, Unitex Pro-Poxy 100.
 - b. Master Builders Solutions/Sika, MasterInject 1380.
 - c. Sika Corporation, Sikadur 35 Hi-Mod LV.
 2. Required properties:

Table 1. Material Properties - Epoxy		
Property	Test Method	Required Results ("neat")
Tensile Strength (7-day)	ASTM D638	7,000 pounds per square inch, minimum.
Compressive Yield Strength (7-day)	ASTM D695	10,000 pounds per square inch, minimum.
Bond Strength (hardened concrete to hardened concrete after 2-day cure)	ASTM C882	1,000 pounds per square inch, minimum. Concrete failure before failure of epoxy.
Viscosity (mixed)		250 to 550 centipoise
Notes:		
(1) Testing results are for materials installed and cured at a temperature between 72 and 78 degrees Fahrenheit for 7 days, unless otherwise noted.		

- C. Epoxy gel: Non-sagging product in accordance with ASTM C881, Types I and IV, Grade 3, Class C.
1. Manufacturers: One of the following, or equal:
 - a. Dayton Superior, Sure Anchor J50.
 - b. Master Builders Solutions/Sika, MasterEmaco ADH 327.
 - c. Sika Corp., Sikadur 31, Hi-Mod Gel.

2. Required properties:

Table 2. Material Properties - Epoxy Gel		
Property	Test Method	Required Results ("neat")
Tensile Strength (7-day)	ASTM D638	2,000 pounds per square inch, minimum.
Compressive Yield Strength (7-day)	ASTM D695	8,000 pounds per square inch, minimum.
Bond Strength (14-day)	ASTM C882	1,500 pounds per square inch, minimum.
Notes:		
(1) Testing results are for materials installed and cured at a temperature between 72 and 78 degrees Fahrenheit for 7 days, unless otherwise noted.		

- D. Epoxy bonding agent: Non-sagging product in accordance with ASTM C881, Type II, Grade 2, Class C.
1. Manufacturers: One of the following, or equal:
 - a. Dayton Superior, Sure Bond J58.
 - b. Master Builders Solutions/Sika, MasterEmaco ADH 326.
 - c. Sika Chemical Corp., Sikadur 32 Hi-Mod LPL.
 2. Required properties:

Table 3. Material Properties - Epoxy Bonding Agent		
Property	Test Method	Required Results
Tensile Strength (7-day)	ASTM D638	3,300 pounds per square inch, minimum.
Compressive Yield Strength (7-day)	ASTM D695	8,300 pounds per square inch, minimum.
Bond Strength (14-days)	ASTM C882	1,800 pounds per square inch, minimum. Concrete failure before failure of epoxy bonding agent.
Pot Life	-	Minimum 30 minutes at 74 degrees Fahrenheit.
Notes:		
(1) Testing results are for materials installed and cured at a temperature between 72 and 78 degrees Fahrenheit for 7 days, unless otherwise noted.		

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install and cure epoxy materials in accordance with manufacturer's installation instructions.
- B. Epoxy:
 1. Apply in accordance with manufacturer's installation instructions.
- C. Epoxy gel:
 1. Apply in accordance with manufacturer's installation instructions.
 2. Use for vertical or overhead work, or where high viscosity epoxy is required.
 3. Epoxy gel used for vertical or overhead work may be used for horizontal work.

- D. Epoxy bonding agent:
1. Apply in accordance with manufacturer's installation instructions.
 2. Will not be required for filling form tie holes or for normal finishing and patching of similar sized small defects.

END OF SECTION

SECTION 03102
CONCRETE FORMWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Concrete formwork.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
1. 117 - Specifications for Tolerances for Concrete Construction and Materials and Commentary.
- B. NSF International (NSF):
1. 61 - Drinking Water System Components - Health Effects.
- C. Underwriters Laboratories (UL).

1.03 TERMINOLOGY

- A. The words and terms listed below are not defined terms that require initial capital letters, but, when used in this Section, have the indicated meaning.
1. Green Concrete: Concrete with less than 100 percent of the minimum specified compressive strength (f'_c).

1.04 SUBMITTALS

- A. Information on proposed forming system:
1. Submit in such detail as the Engineer may require to assure themselves that intent of the Specifications can be complied with by use of proposed system.
 2. Alternate combinations of plywood thickness and stud spacing may be submitted.
- B. Form release agent. NSF 61 certification prepared by NSF, Underwriters Laboratories (UL) or other, similar, nationally recognized testing laboratory acceptable to the Engineer.

1.05 QUALITY ASSURANCE

- A. Qualifications of formwork manufacturers: Use only forming systems by manufacturers having a minimum of 5 years of experience, except as otherwise specified, or accepted in writing by the Engineer.
- B. Regulatory requirements: Install work of this Section in accordance with local, state, and federal regulations.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Design requirements:
 - 1. Design of concrete forms, falsework, and shoring in accordance with local, state, and federal regulations.
 - 2. Design forms and ties to withstand concrete pressures without bulging, spreading, or lifting of forms.

- B. Performance requirements:
 - 1. Construct forms so that finished concrete conforms to shapes, lines, grades, and dimensions indicated on the Drawings.
 - 2. It is intended that surface of concrete after stripping presents smooth, hard, and dense finish that requires minimum amount of finishing.
 - 3. Provide sufficient number of forms so that the work may be performed rapidly and present uniform appearance in form patterns and finish.
 - 4. Use forms that are clean and free from dirt, concrete, and other debris.
 - a. Coat with form release agent if required, prior to use or reuse.

2.02 MANUFACTURED UNITS

- A. Forms: Built-up plywood:
 - 1. Built-up plywood forms may be substituted for prefabricated forming system subject to following minimum requirements:
 - a. Size and material:
 - 1) Use full size 4-foot by 8-foot plywood sheets, except where smaller pieces are able to cover entire area.
 - 2) Sheet construction: 5-ply plywood sheets, 3/4-inch nominal, made with 100 percent waterproof adhesive, and having finish surface that is coated or overlaid with surface which is impervious to water and alkaline calcium and sodium hydroxide of cement.
 - b. Wales: Minimum 2-inch by 4-inch lumber.
 - c. Studding and wales: Contain no loose knots and be free of warps, cups, and bows.

- B. Forms: Steel or steel framed:
 - 1. Steel forms:
 - a. Rigidly constructed and capable of being braced for minimum deflection of finish surface.
 - b. Capable of providing finish surfaces that are flat without bows, cups, or dents.
 - 2. Steel framed plywood forms:
 - a. Provide forms that are rigidly constructed and capable of being braced.
 - b. Plywood paneling: 5-ply, 5/8-inch nominal or 3/4-inch nominal, made with 100 percent waterproof adhesive, and having finish surface that is coated or overlaid with surface which is impervious to water and alkaline calcium and sodium hydroxide of cement.

- C. Form release agent.

1. Effective, non-staining, bond-breaking coating compatible with form surfaces and concrete mixes used.
 2. Certified for conformance to NSF 61 and leaving no taste or odor on the concrete surface.
- D. Form ties:
1. General:
 - a. Provide form ties for forming system selected that are manufactured by recognized manufacturer of concrete forming equipment.
 - b. Do not use wire ties or wood spreaders of any form.
 - c. Provide ties of type that accurately tie, lock, and spread forms.
 - d. Provide form ties of such design that when forms are removed, they locate no metal or other material within 1-1/2 inches of the surface of the concrete.
 - e. Do not allow holes in forms for ties to allow leakage during placement of concrete.
 2. Cone-snap ties:
 - a. Cone-snap ties shall form a cone shaped depression in the concrete with minimum diameter of 1 inch at the surface of the concrete and minimum depth of 1-1/2 inches.
 - b. Provide neoprene waterseal washer that is located near the center of the concrete.
 3. Taper ties:
 - a. Neoprene plugs for taper tie holes: Size so that after they are driven, plugs are located in center third of wall thickness.
- E. Incidentals:
1. External angles:
 - a. Where not otherwise indicated on the Drawings, provide with 3/4-inch bevel, formed by utilizing true dimensioned wood or solid plastic chamfer strip on walkways, slabs, walls, beams, columns, and openings.
 - b. Provide 1/4-inch bevel formed by utilizing true dimensioned wood or solid plastic chamfer strip on walkways, walls, and slabs at expansion, and construction joints.
 2. Keyways: Steel, plastic, or lumber treated with form release agent.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Site verification of conditions:
1. Do not place concrete until forms have been checked for alignment, level, and strength, and mechanical and electrical inserts or other embedded items for correct location.

3.02 INSTALLATION

- A. Forms: Built-up plywood:
1. Studding:
 - a. Spaced at 16 inches or 24 inches on center.

- b. Closer spacing may be required depending upon strength requirements of the forms, in order to prevent any bulging surfaces on faces of finished concrete work.
 - c. Install studs perpendicular to grain of exterior plies of plywood sheets.
 - 2. Wales: Form wales of double lumber material with minimum size as specified in this Section.
 - 3. Number of form reuses: Depends upon durability of surface coating or overlay used, and ability to maintain forms in condition such that they are capable of producing flat, smooth, hard, dense finish on concrete when stripped.
- B. Forms: Steel or steel framed:
 - 1. Steel forms:
 - a. Adequately brace forms for minimum deflection of finish surface.
 - 2. Steel framed plywood forms:
 - a. Rigidly construct and brace with joints fitting closely and smoothly.
 - b. Number of form reuses: Depends upon durability of surface coating or overlay used.
 - 3. Built-up plywood forms: As specified in this Section may be used in conjunction with steel forms or steel framed plywood forms for special forming conditions such as corbels and forming around items which will project through forms.
- C. Form bracing and alignment:
 - 1. Line and grade: Limit deviations to tolerances which will permit proper installation of structural embedded items or mechanical and electrical equipment and piping.
 - 2. Formwork:
 - a. Securely brace, support, tie down, or otherwise hold in place to prevent movement.
 - b. Make adequate provisions for uplift pressure, lateral pressure on forms, and deflection of forms.
 - 3. When second lift is placed on hardened concrete: Take special precautions in form work at top of old lift and bottom of new lift to prevent:
 - a. Spreading and vertical or horizontal displacement of forms.
 - b. Grout "bleeding" on finish concrete surfaces.
 - 4. Pipe stubs, anchor bolts, and other embedded items: Set in forms where required.
 - 5. Cracks, openings, or offsets at joints in formwork: Close those that are 1/16-inch or larger by tightening forms or by filling with acceptable crack filler.
- D. Forms: Incidentals:
 - 1. Keyways: Construct as indicated on the Drawings.
 - 2. Reentrant angles: May be left square.
 - 3. Level strips: Install at top of wall concrete placements to maintain true line at horizontal construction joints.
 - 4. Inserts:
 - a. Encase pipes, anchor bolts, steps, reglets, castings, and other inserts, as indicated on the Drawings or as required, in concrete.
 - 5. Pipe and conduit penetrations:
 - a. Install pipe and conduit in structures as indicated on the Drawings, and seal with materials as specified in Section 07900 - Joint Sealants.

- E. Form release agent:
 - 1. Apply in accordance with manufacturer's instructions.
- F. Form ties:
 - 1. Cone-snap ties: Tie forms together at not more than 2-foot centers vertically and horizontally.

3.03 FORM REMOVAL

- A. General:
 - 1. Keep forms in place, as specified in the following paragraphs, to provide curing and to protect concrete surfaces and edges from damage.
 - 1. Immediately after forms are removed, carefully examine concrete surfaces, and repair any irregularities in surfaces and finishes as specified.
- B. Form removal:
 - 1. Do not remove forms from concrete which has been placed when outside ambient air temperature is below 50 degrees Fahrenheit until the following conditions are satisfied:
 - a. Concrete has sufficient strength to allow form removal without damage to surfaces.
 - a. At least 48 hours have elapsed since the end of concrete placement.
 - b. Provisions are in place to maintain moisture for curing concrete, and temperature at or above the required minimum curing temperature specified.
 - 2. Vertical forms:
 - a. Retain in place for a minimum of 24 hours after concrete is placed.
 - b. If concrete has sufficient strength and hardness to resist surface or other damage after 24 hours, forms may be removed.
 - 3. Other forms supporting concrete, and shoring: Retain in place as follows:
 - a. Formed sides of footings: 24 hours minimum.
 - c. Formed vertical sides of beams, girders, and similar members: 48 hours minimum.
 - b. Forms below slabs, beams, and girders: Until concrete strength reaches specified strength $f'c$ or until shoring is installed.
 - 1) Shoring for slabs, beams, and girders: Shore until concrete strength reaches minimum specified 28-day compressive strength.

3.04 SURFACE REPAIRS AND FINISHING

- A. Immediately after forms are removed, carefully examine concrete surfaces, and repair any irregularities in surfaces and finishes as specified in Section 03300 - Cast-in-Place Concrete.
- B. Form ties: Remove form ties from surfaces. Fill tie holes as follows:
 - 1. Remove form ties from surfaces.
 - 2. Roughen cone shaped tie holes by heavy sandblasting before repair.
 - 3. Dry pack cone shaped tie holes with dry-pack mortar as specified in Section 03600 - Grouting.

4. Taper ties:
 - a. After forms and taper ties are removed from wall, plug tie holes with neoprene plug as follows:
 - 1) Heavy sandblast and then clean tie holes.
 - 2) After cleaning, drive neoprene plug into each of taper tie holes with steel rod. Final location of neoprene plug shall be in center third of wall thickness. Bond neoprene plug to concrete with epoxy.
 - 3) Locate steel rod in cylindrical recess and against middle of plug during driving.
 - a) At no time are plugs to be driven on flat area outside cylindrical recess.
 - b. Dry-pack of taper tie holes:
 - 1) After installing plugs in tie holes, coat tie hole surface with epoxy bonding agent and fill with dry-pack mortar as specified in Section 03600 - Grouting.
 - a) Place dry-pack mortar in holes in layers with thickness not exceeding tie hole diameter and heavily compact each layer.
 - b) Dry-pack the outside of the hole no sooner than 7 days after the inside of the hole has been dry packed.
 - c) Wall surfaces in area of dry-packed tie holes: On the water side of water containing structures and the outside of below grade walls:
 - (1) Cover with minimum of 10 mils of epoxy gel.
 - (2) Provide epoxy gel coating on wall surfaces that extend minimum of 2 inches past dry-pack mortar filled tie holes.
 - (3) Provide finish surfaces that are free from sand streaks or other voids.

3.05 TOLERANCES:

- A. Finished concrete shall conform to shapes, lines, grades, and dimensions indicated on the Drawings.
- B. Construct work within the tolerances in accordance with ACI 117, except as modified in the following paragraphs or as indicated on the Drawings.
 1. General:
 - a. At certain locations in the Work, tolerances required for equipment placement and operation may be more restrictive than the general tolerance requirements of this Section.
 - b. Confirm equipment manufacturers' required tolerances for location and operation of equipment that will be installed, and construct concrete to satisfy those requirements.
 2. Slabs:
 - a. Slope: Uniformly sloped to drain when slope is indicated on the Drawings.
 - b. Slabs indicated to be level: Have maximum vertical deviation of 1/8-inch in 10-foot horizontal length without any apparent changes in grade.
 3. Circular tank walls:
 - a. The Contractor may deviate from finish line indicated on the Drawings by use of forms with chord lengths not to exceed 2 feet.

4. Inserts and embedments:
 - a. Set inserts and embedments to tolerances required for proper installation and operation of equipment or systems to which insert pertains.
 - b. Maximum tolerances: As follows:

Item	Tolerance
Sleeves and inserts	Plus 1/8 Minus 1/8 inches.
Anchor bolts:	
Projected ends	Plus 1/4 Minus 0.0 inches.
Axial alignment	Not more than 2 degrees off the axis indicated on the Drawings.
Setting location	Plus 1/16 Minus 1/16 inches.
All embedments	Minimum 1 inch clearance from reinforcing steel.

- c. Securing embedded items in formwork by wiring or welding to reinforcement is not permitted.
- C. Remove and replace work that does not conform to required tolerances. Procedures and products employed in and resulting from such re-work shall be acceptable to the Engineer.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Cast-in-place concrete.
- B. The requirements of this Section will require advance planning for preparation and testing of trial batches. Review the mix design and testing requirements carefully, and schedule preparations and testing with sufficient time to complete tests, to obtain Engineer's review of mixes and testing results, and to complete revisions and re-testing if required.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. CODE-318 - Building Code Requirements for Structural Concrete and Commentary.
 - 2. CODE-350 - Code Requirements for Environmental Engineering Concrete Structures and Commentary.
 - 3. PRC-212.3 - Report on Chemical Admixtures for Concrete.
 - 4. PRC-302.1 - Guide to Concrete Floor and Slab Construction.
 - 5. PRC-305 - Guide to Hot Weather Concreting.
 - 6. PRC-306 - Guide to Cold Weather Concreting.
- B. ASTM International (ASTM):
 - 1. C29 - Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate.
 - 2. C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 3. C33 - Standard Specification for Concrete Aggregates.
 - 4. C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 5. C40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
 - 6. C42 - Standard Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - 7. C88 - Standard Test Method of Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
 - 8. C94 - Standard Specification for Ready-Mixed Concrete.
 - 9. C114 - Standard Test Methods for Chemical Analysis of Hydraulic Cement.
 - 10. C117 - Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing.
 - 11. C123 - Standard Test Method for Lightweight Particles in Aggregate.

12. C131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
13. C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
14. C138 - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
15. C142 - Standard Test Method for Clay Lumps and Friable Particles in Aggregate.
16. C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete.
17. C150 - Standard Specification for Portland Cement.
18. C156 - Standard Test Method for Water Loss from a Mortar Specimen Through Liquid Membrane-Forming Curing Compounds for Concrete.
19. C157 - Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
20. C171 - Standard Specifications for Sheet Materials for Curing Concrete.
21. C172 - Standard Practice for Sampling Freshly Mixed Concrete.
22. C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
23. C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
24. C293 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading).
25. C295 - Standard Guide to Petrographic Examination of Aggregates for Concrete.
26. C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
27. C311 - Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete.
28. C494 - Standard Specification for Chemical Admixtures for Concrete.
29. C595 - Standard Specification for Blended Hydraulic Cements.
30. C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
31. C702 - Standard Practice for Reducing Samples of Aggregate to Testing Size.
32. C856 - Standard Practice for Petrographic Examination of Hardened Concrete.
33. C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.
34. C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
35. C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
36. C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
37. C1260 - Standard Test Method of Potential Alkali Reactivity of Aggregates (Mortar Bar Method).
38. C1293 - Standard Test Method for Determination of Length Change of Concrete due to Alkali-Silica Reaction.
39. C1567 - Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).
40. C1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

41. C1778 - Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete.
42. D29 - Standard Practice for Determining Volatile and Nonvolatile Content of Cellulosics, Emulsions, Resin Solutions, Shellac, and Varnishes.
43. D75 - Standard Practice for Sampling Aggregates.
44. D2103 - Standard Specification for Polyethylene Film and Sheeting.
45. D3665 - Standard Practice for Random Sampling of Construction Materials.
46. D4791 - Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

C. National Ready-Mixed Concrete Association (NRMCA).

1.03 TERMINOLOGY

- A. The words and terms listed below are not defined terms that require initial capital letters, but, when used in this Section, have the indicated meaning.
 1. Alkali: The sum of sodium oxide and potassium oxide calculated as sodium oxide.
 2. Alkali Load: Amount of alkalies contributed by the Portland cement in a concrete mixture, expressed in pounds per cubic yard (lb/yd³) and calculated by multiplying the Portland cement content of the concrete in lb/yd³ by the alkali content of the Portland cement, or the Portland cement portion of a blended cement, divided by 100.
 3. Architectural Concrete: Concrete surfaces that will be exposed to view in the finished work.
 - a. For purposes of this Section, includes only those surfaces that receive paint or coatings.
 - b. Exposed concrete surfaces in open basins, channels, and similar liquid containing structures: Surfaces will be considered exposed to view if located above the water line as defined in Section 03366 - Concrete Finishes.
 - c. Exterior concrete surfaces with portions above and below grade: Surface will be considered exposed to view of located above the grade line as defined in Section 03366 - Concrete Finishes.
 4. Average Daily Temperature: Calculated by summing hourly measurements of air temperature in the shade at the face of the concrete and dividing that sum by 24. In calculating the sum of the temperatures recorded, any measurement less than 50 degrees Fahrenheit shall be recorded as 0 degrees Fahrenheit and included in the sum.
 5. Cementitious Materials: Portland cement or blended cement and supplementary cementitious materials.
 6. Class of Concrete: Refers to a mix with characteristics, proportions, and constituents (including a specific combination of admixtures) as specified in this Section.
 - a. Any change in the source or characteristics of constituent materials, in the proportions of materials, or in the admixtures included in a mix shall be considered as creating a new and separate class of concrete.
 - b. Any mix to be placed by pumping shall be considered as creating a new and separate class of concrete.
 7. Cold Weather: Includes one or more of the following conditions:
 - a. Current air temperature is 45 degrees Fahrenheit and falling.

- b. Air temperature during the first 24 hours after placement is expected to fall into the range of 45 degrees Fahrenheit to 40 degrees Fahrenheit.
- c. A period when, for more than 3 consecutive days, the following conditions exist:
 - 1) The average daily air temperature drops below 40 degrees Fahrenheit.
 - 2) The air temperature is not greater than 50 degrees Fahrenheit for more than one-half of any consecutive 24-hour period.
- 8. Cold Weather Concreting: Operations for placing, finishing, curing, and protecting concrete during cold weather.
- 9. Green Concrete: Concrete that has not yet achieved 100 percent of the minimum specified compressive strength, f'c, for that mix.
- 10. Hairline Crack: Crack with a crack width of less than 4 thousandths of an inch (0.004 inches).
- 11. Hot Weather: Any combination of ambient temperature, concrete temperature, relative humidity, wind speed, and solar radiation intensity that creates conditions that will evaporate water from a free concrete surface at a rate equal to or greater than 0.2 pounds per square foot per hour as determined by the Menzel Formula and nomograph published in ACI PRC-305 and in this Section, Attachment A - Menzel Formula and Nomograph.
- 12. Hot Weather Concreting: Operations for placing, finishing, curing, and protecting concrete during hot weather.
- 13. Paste Content: The total concrete volume minus the volume of aggregate, expressed as a percentage of total volume. Paste volume includes volume of cementitious materials, water, air, admixtures materials, and any fibers.
- 14. Supplemental Cementitious Material: Inorganic material such as fly ash, natural pozzolans, silica fume, or slag cement that reacts pozzolanically or hydraulically.

1.04 DELEGATED DESIGN

- A. Provide Delegated Design for the following Work, based on the requirements of this Section.
 - 1. Concrete mix designs.

1.05 SUBMITTALS

- A. General:
 - 1. Data for concrete mixes and mix constituents supplied to the Work shall be coordinated through a single supplier.
 - 2. A maximum of 2 mix designs will be reviewed by the Engineer for each class of concrete required.
 - a. Review of additional mix designs shall be at the expense of the Contractor.
- B. Product data:
 - 1. Submit data completely describing products and demonstrating compliance with the requirements of this Section.
 - 2. Data for all products in the mix for each class of concrete shall be submitted concurrently with that mix design.

3. Where products conforming to NSF-61 are required, submit evidence of testing and listing under NSF-61 for use in direct contact with potable water. Testing and listing shall be by a nationally recognized agency acceptable to the Engineer.
 4. Admixtures:
 - a. For each admixture included in concrete mixes, submit manufacturer's product data demonstrating compliance with standards specified.
 - b. If air entraining admixture requires test method other than ASTM C173 to accurately determine air content, make special note of requirements in Submittal.
 5. Curing compound: Submit complete data on proposed compound.
- C. Design data:
1. Concrete mix designs:
 - a. Submit full details, including mix design calculations and plots, for concrete mixes proposed for use for each class of concrete.
 - b. Include mix design calculations of proportions by both weight and volume.
 - c. Determine and include the alkali load of the proposed mix.
 - d. Include information on correction of batching for varying moisture contents of fine aggregate.
 - e. Submit source quality test records with mix design Submittal.
 - f. Provide calculations demonstrating that the mixes proposed provide the required average compression strength of concrete (f'_{cr}) based on source quality test records.
 - g. For each Class A mix design submitted, plot the mix design Attachment B - Coarseness Factor Chart and submit.
 - h. For each Class A mix design submitted, plot the combined aggregate gradation on the chart Attachment C - Combined Aggregate Gradation Chart and submit.
- D. Concrete mixes - Trial batches:
1. Compression strength test results.
 - a. Submit results of testing. Provide data for each cylinder tested.
 - b. Submit data indicating trial batch mix designator, slump, and specimen number for each test cylinder.
 - 1) Using indelible marker, clearly label each cylinder with concrete class, trial batch number, and specimen number.
 2. If there is any change in suppliers or in quality of concrete mix constituents, submit new test data.
- E. Test reports:
1. Dated not more than 24 months prior to the date of Submittal.
 2. Aggregate:
 - a. Submit certified copies of commercial laboratory tests proposed for use in concrete.
 - b. Sieve analyses:
 - 1) During construction, submit sieve analyses of coarse, fine, and combined aggregates used any time there is a change in supplier, or a significant change in the character and/or grading of materials, and when requested by the Engineer.

- c. Aggregates - coarse:
 - 1) Physical properties:
 - a) Sieve analysis.
 - b) Percentage of particles having flat and/or elongated characteristics.
 - c) Abrasion loss.
 - d) Soundness.
 - 2) Deleterious substances:
 - a) Clay lumps and friable particles content.
 - b) Materials finer than 200 sieve (percentage).
 - c) Shale and chert content.
 - d) Coal and lignite content.
 - 3) Alkali reactivity.
 - 4) Deleterious substances:
 - a) Clay lumps and friable particles content.
 - b) Chert and shale content.
 - c) Coal and lignite content.
 - d) Materials finer than No. 200 sieve.
 - 5) Alkali reactivity.
 - d. Aggregates - Fine:
 - 1) Physical properties:
 - a) Sieve analysis and fineness modulus.
 - b) Soundness.
 - 2) Deleterious substances:
 - a) Clay lumps and friable particles (percentage).
 - b) Materials finer than No. 200 sieve (percentage).
 - c) Coal and lignite (percentage).
 - d) Shale and chert.
 - e) Organic impurities ("Color" as determined by ASTM C40).
 - 3) Alkali reactivity.
 - e. Aggregates - Combined:
 - 1) Test combined gradation for the following sieve sizes: 1.5 inches, 1 inch, 3/4 inch, 1/2 inch, 3/8 inch, Number 4, Number 8, Number 16, Number 30, Number 100, Number 200.
 - 2) Bulk density in accordance with ASTM C29.
 - 3) Void content in accordance with ASTM C29.
 - 4) Submit at:
 - a) Initial mixture design Submittal.
 - b) Intervals of not more than 4 weeks.
 - c) Any time there is a change in character or grading of constituent materials.
 - d) When requested by the Engineer.
3. Cement:
- a. Mill tests, including alkali content measured as equivalent alkalies, for each shipment of cement included in the Work.
 - 1) During construction, submit mill certificates for cement being used at intervals of not more than 90 days, any time there is a change in supplier or a significant change in the character of the materials, and when requested by the Engineer.

4. Supplemental cementitious material:
 - a. Fly ash: Identify source and provide testing results to demonstrate compliance with requirements of ASTM C618 and this Section.
 - 1) Include supplier's report certifying the total alkali content of the material, expressed as equivalent percentage of sodium oxide (Na_2Oe).
 - b. Slag cement: Identify source and provide testing results to demonstrate compliance with requirements of ASTM C989 and this Section.
 - c. Silica fume: Identify source and provide testing results to demonstrate compliance with requirements of ASTM C1240 and this Section.
- F. Certificates:
 1. Current NRMCA certification for all plants and trucks that will be used to supply concrete.
- G. Source quality control Submittals:
 1. Truck batch tickets for each load of concrete delivered to the site, whether accepted or rejected.
 2. Concrete supplier's quality control plan. Include the following elements, at a minimum:
 - a. Names and qualifications of key quality control personnel:
 - 1) Quality control manager.
 - 2) Testing and inspection personnel.
 - b. Names and qualifications of testing laboratories:
 - 1) Each laboratory shall hold current accreditation from the AASHTO Accreditation Program, or other accreditation program acceptable to the Engineer, for each test performed.
 - c. Example forms for: Inspection reports, certificates of compliance, and test results.
 - d. Quality control procedures: Method and frequency of performing each procedure, including inspections and materials testing. At a minimum, the plan shall include:
 - 1) Daily testing of aggregate gradation.
 - 2) Monthly testing of cement quality.
 - 3) Monthly testing of fly ash quality.
 - e. Procedures to control quality characteristics, including standard procedures to address properties outside the specified operating limits, and example reports to document non-conformances and corrective actions taken. Include procedure for notifying Contractor and Engineer of non-conformances.
 - f. Procedures for verifying that:
 - 1) Materials are properly stored during concrete batching operations.
 - 2) Batch plants have the ability to maintain concrete consistency during periods of extreme heat and of low temperatures.
 - 3) Admixtures are dispensed in the correct dosages within the accuracy requirements specified.
 - 4) Delivery trucks have a valid NRMCA certification card.

- g. Procedures for verifying that weighmaster certificate for each load of concrete shows:
 - 1) Cement and supplementary materials are from sources designated in the approved Submittals.
 - 2) Concrete as-batched complies with the constituent weights designated in the approved Submittals.
 - 3) Corrections for aggregate moisture are being correctly applied.
 - 4) Any mix water withheld from the batch.
 - h. Procedures for visually inspecting concrete during discharge.
- H. Field quality control Submittals:
- 1. Contractor's notifications of readiness for concrete placement.
 - 2. Contractor's reports of field quality control testing.
 - a. Include with each report the concrete batch ticket number and identification numbers for associated cylinders used for compressive strength testing.
 - b. Testing results for slump, temperature, unit weight, and air entrainment.
 - c. Testing results for compressive strength at 7 and 28 days, and for any compressive strength tests after 28 days.
 - d. Note on batch ticket the amount of water that was withheld and the maximum amount that can be added on site as "Max add water." Record on the batch ticket the volume of water actually added at site.
 - e. Note on the batch ticket the concrete mix classification as defined in Table 3 of this Section.
- I. Special procedure Submittals:
- 1. Sequence of concrete placing:
 - a. Submit proposed sequence of placing concrete showing proposed beginning and ending of individual placements. Submittal shall include plans sections and details to address all pours.
 - 2. Cold weather concreting plan.
 - 3. Hot weather concreting plan.
 - 4. Repair of defective concrete: Submit mix design for repair materials to be used.

1.06 QUALITY ASSURANCE

- A. Pre-installation meetings:
- 1. Schedule and conduct pre-installation meeting at least 10 days prior to batching and placing of concrete.
 - a. Provide additional meetings if necessary, to discuss specific concrete Submittals, mixes, or placing and curing conditions.
 - b. Notify Engineer of location and time of each conference.
 - 2. Required attendees:
 - a. Contractor including Contractor's superintendent and key personnel.
 - b. Concrete supplier.
 - c. Technical representative(s) of supplier(s) of concrete admixtures.
 - d. Subcontractor(s) providing pumping, placing, finishing, and curing.
 - e. Subcontractor(s) providing embedded items (structural embedded plates, electrical conduit).
 - f. Sampling and testing personnel.
 - g. Engineer.

- h. On-site inspectors representing Engineer.
 - i. Other persons deemed by the Engineer and the Contractor to be critical to the quality and efficiency of the Work.
3. Agenda:
- a. Review of requirements of Drawings and Specifications.
 - b. Project and product safety requirements.
 - c. Discussion of points of interface and coordination between various trades or products to be used in the Work.
 - d. Contractor's schedule for cast-in-place concrete work.
 - e. Mix designs, mix tests, and Submittals.
 - f. Admixture types, dosing, performance, requirements for monitoring, and limits on dosing or re-dosing at the site.
 - g. Placement and consolidation methods, techniques, and equipment and the effects of those methods on form pressures.
 - h. Slump and limits on placing time or conditions to maintain placeability.
 - 1) Field adjustment of slump and air content.
 - i. Procedures for finishing, curing, and retention of moisture during these operations.
 - j. Procedures and protection for hot and cold weather conditions.
 - k. Requirements and coordination for inspections.
 - 1) Responsibility for test specimen curing and storage.
 - 2) Distribution of test reports.
 - l. Other Specification requirements requiring coordination between parties to the work.
4. Prepare and submit minutes of the pre-installation meeting as specified in Section 01312 - Project Meetings.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Packing and shipping:
- 1. Deliver, store, and handle concrete materials in manner that prevents damage and inclusion of foreign substances.
 - 2. Deliver and store packaged materials in original containers until ready for use.
 - 3. Deliver aggregate to mixing site and handle in such manner that variations in moisture content will not interfere with steady production of concrete of specified degree of uniformity and slump.
- B. Acceptance at site:
- 1. Reject material containers or materials showing evidence of water or other damage.
 - 2. Concrete mixes: Do not accept or incorporate into the Work concrete mixes that do not comply with the specified requirements for water content, slump, temperature, and air content.

1.08 PROJECT CONDITIONS

- A. Cold weather concreting: During periods of cold weather as defined in this Section, implement cold weather concreting procedures in this Section.
- B. Hot weather concreting: During periods of hot weather as defined in this Section, implement hot weather concreting procedures in this Section.

1.09 SEQUENCING AND SCHEDULING

- A. Schedule placing of concrete in a manner that completes all placing operations from one construction, contraction, or expansion joint to another construction, contraction, or expansion joint.
- B. Joints at each end of the placement shall be as indicated on the Drawings, or as identified and accepted in advance by the Engineer.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. It is the intent of this Section to secure, for every part of the Work, concrete with a homogeneous mixture, that, when hardened, will have required strength, watertightness, and durability.
- B. It is the intent of this Section to procure a workable, low-shrinkage concrete mix that maximizes aggregate content and minimizes paste content.
- C. Performance requirements:
 - 1. General:
 - a. Except as otherwise specified, provide concrete composed of Portland cement or blended cement, supplemental cementitious materials, aggregate, admixtures and water, proportioned and mixed to produce a plastic, workable mixture in accordance with requirements of this Section, and suitable to specific conditions of placement.
 - b. Proportion aggregates to produce an optimized gradation of aggregate that combines fine , , and coarse aggregate in well-graded proportions that maximizes the aggregate content and minimizes the paste content of the mix. Gradation should maximize long-term durability and strength of the concrete mixture.
 - c. Durability requirements will be deemed to be satisfied when:
 - 1) Mixture is proportioned with a well-graded combined aggregate.
 - 2) Specified water-cement ratio is satisfied.
 - 3) Concrete contains the specified range of air content.
 - 4) Maximum specified paste content is satisfied.
 - 5) Requirements of ASTM C1778 to reduce the risk of deleterious alkali-aggregate reactions are satisfied. Reduce alkali loading of concrete, provide minimum supplemental cementitious material content, or both as required.
 - a) Size and Exposure Conditions (ASTM C1778, Table 2):
Concrete exposed to humid air, buried or immersed Concrete exposed to alkalis in service.
 - b) Structure Class (ASTM C1778, Table 3): Class SC3.
 - d. Proportion materials in a manner that will secure the lowest cement content, water-cementitious materials ratio, and paste volume that is consistent with good workability that provides a plastic and cohesive mixture, and that provides a slump that is within the specified range.

- e. Construction, contraction, and expansion joints have been positioned in structures as indicated on the Drawings, and curing methods have been specified, for purpose of to reduce the number and size of cracks, resulting from normal expansion and contraction expected from the concrete mixes specified.
 - f. Remove and replace, or repair as specified in this Section, non-conforming work and surfaces with cracks, voids and honeycombs, or surface wetness.
2. Workmanship and methods: Provide concrete work, including detailing of reinforcing, conforming with best standard practices and as set forth in ACI CODE-318, and ACI CODE-350.

2.02 MATERIALS - GENERAL

- A. Water and ice:
- 1. Water for concrete mixes, for washing aggregate, and for curing concrete: Clean and free from oil and deleterious amounts of alkali, acid, organic matter, or other substances from a municipal potable water source.
 - 2. Do not use water from concrete production operations, or combined water from concrete production operations as defined in ASTM C1602.

2.03 MATERIALS - CONCRETE MIX CONSTITUENTS

- A. Water and ice:
- 1. As specified in the preceding paragraphs.
- B. Cementitious materials:
- 1. Portland cement:
 - a. In accordance with ASTM C150.
 - 1) Type II , or Type II(MH) as scheduled for each mix.
 - b. Single source: To provide uniformity of appearance, for each structure use only one source, type, and brand of Portland cement for walls and slabs that will be exposed in the finished work.
 - 1) Confirm adequate supply of cement over duration of project before making trial batches or beginning concrete placements.
 - c. Cement for finishing: Provide cement from same source and of same type as concrete to be finished or repaired.
 - d. In accordance with NSF 61.
 - 2. Blended hydraulic cement:
 - a. In accordance with ASTM C595:
 - 1) Type IP (MS).
 - 2) Type IL (MS).
 - 3) Type IS (<70)(MS).
 - b. Single source: To provide uniformity of appearance and quality, for each structure use only 1 source, type, and brand of cement.
 - c. Confirm adequate supply of cement over duration of project before making trial batches or beginning concrete placements.
 - d. Cement for finishing: Provide cement from same source and of same type as concrete to be finished or repaired.

- C. Supplementary cementitious materials:
1. Fly ash:
 - a. Class C or Class F fly ash in accordance with the requirements of ASTM C618, except as modified in this Section.
 - 1) Class C may be used in concrete made with Type II Portland cement.
 - 2) Class F required if used in concrete mixes containing aggregates classified as potentially reactive based on ASTM C1293 or ASTM C1260.
 - a) CaO content: Less than 18 percent.
 - b. Loss on ignition: Not exceeding 3 percent.
 - c. In accordance with NSF 61.
 - d. Replace Portland cement at ratio of 1.0 pound fly ash for each pound of cement, up to minimum and maximum replacement as specified in "Requirements for Mix Proportioning."
 2. Slag cement:
 - a. Grade 80, 100, or 120 in accordance with ASTM C989, except as modified below:
 - 1) Fineness: Amount retained on a No. 325 sieve: 20 percent maximum.
 - 2) Total alkalis $\text{Na}_2\text{O} + 0.658 \text{K}_2\text{O}$:
 - a) Minimum: 0.60 percent.
 - b) Maximum: 0.90 percent.
 3. Silica fume:
 - a. Provide silica fume in accordance with ASTM C1240, except as modified below:
 - 1) Moisture content: 3 percent maximum.
 - 2) Loss on ignition: 6 percent maximum.
 - 3) Reactivity with cement alkalis: 80 percent minimum.
 - 4) Sulfate resistance: Maximum 0.10 percent expansion at 6 months
 - b. In accordance with NSF 61.
- D. Admixtures:
1. General:
 - a. Do not include admixtures, other than those specified, unless written acceptance has been obtained from the Engineer during Submittal of mix designs.
 - b. Admixtures shall be compatible with concrete constituents and with other admixtures.
 - 1) All admixtures in a given mix shall be products of the same manufacturer to ensure compatibility.
 - 2) Admixture manufacturers: One of the following, or equal.
 - a) Euclid Chemical.
 - b) GCP Applied Technologies (formerly W.R. Grace).
 - c) Master Builders Solutions/Sika.
 - d) Sika Corp.
 - c. Do not use admixtures containing chlorides, calculated as chloride ion, in excess of 0.5 percent by weight of cement.
 - d. Use in accordance with manufacturer's recommendations. Add each admixture to concrete mix separately.

- e. Admixtures used shall be the same products used in concrete trial batches, or the same products used in concrete represented by submitted field test records.
2. Air entraining admixture (AEA):
 - a. In accordance with ASTM C260 and dosed to provide entrained air percentages specified in this Section.
 - b. Provides entrained air as bubbles, evenly dispersed at the time of placement and during curing.
 3. Water reducing admixture(WRA):
 - a. May be used at the Contractor's option.
 - b. Conforming to ASTM C494, Type A (water-reducing).
 - 1) ASTM C494, Type D (water-reducing and retarding) may be used during periods of hot weather with prior acceptance by the Engineer.
 - c. Not containing air-entraining agents.
 - d. Liquid form before adding to the concrete mix.
 4. High-range, water-reducing admixture ("superplasticizer") (HRWR):
 - a. In accordance with ASTM C494, Type F (high-range, water-reducing).
 - 1) ASTM C494, Type G (high-range, water-reducing and retarding) may be used during periods of hot weather with prior acceptance by the Engineer.
 - b. Producing non-segregating, plasticized concrete with little bleeding and the physical characteristics of low water/cement ratio concrete.
 - c. Admixture shall maintain treated concrete in a plasticized state for not less than 1 hour.
 - a)
 5. Shrinkage reducing admixture (SRA):
 - a. May be used at Contractor's option.
 - 1) Provide shrinkage reducing admixture in sufficient dosage so as to produce shrinkage within the limits specified.
 - b. Not containing expansive agents.
 - c. In accordance with ASTM C494, Type S (specific performance).
 - d. One of the following, or equal:
 - 1) Euclid Chemical: Eucon SRA Series.
 - 2) GCP Applied Technologies: Eclipse Series.
 - 3) Master Builders Solutions/Sika: SRA Series.
 6. Set-controlling admixtures:
 - a. Shall not be used without prior acceptance from Engineer.
 - b. Retarders, when permitted:
 - 1) In accordance with ASTM C494, Type B, D or G.
- E. Coloring admixtures:
1. Conduit encasement coloring agent:
 - a. Red color concrete used for encasement of electrical ducts, conduits, and similar type items.
 - b. Manufacturers: One of the following, or equal:
 - 1) Davis Co., #100 Utility Red.
 - 2) Euclid Chemical Co., Increte Division, "Colorcrete Brick Red".
 - 3) I. Reiss Co., Inc., equivalent product.
 - c. Conduit encasement concrete: Mix into each cubic yard of concrete 10 pounds of coloring agent.

- F. Aggregate:
1. General:
 - a. Provide concrete aggregates that are sound, graded as specified, and free of deleterious material in excess of allowable amounts specified.
 - b. Provide aggregates to produce in place concrete with unit weight as follows:
 - 1) Normal weight concrete: Not less than 140 pounds per cubic foot.
 - c. Do not use aggregate made from recycled materials such as crushed and screened hydraulic-cement concrete, brick, and other construction materials.
 - d. Do not use aggregate recycled from fresh concrete returned to the batching facility.
 - e.
 2. Alkali-silica reactivity:
 - a. Provide aggregate classified as aggregate-reactivity class of R0 in accordance with ASTM C1778 with expansion not greater than 0.10 percent at 14 days when tested in accordance with ASTM C1260, and not greater than 0.04 percent at 1 year when tested in accordance with ASTM C1293.
 - b. Aggregates classified as potentially reactive based on the preceding tests may be permitted, at the discretion of the Engineer, if the following condition is satisfied:
 - 1) ASTM C1567: Testing with the reactive aggregate, cement, and supplemental cementitious materials demonstrate that expansion is less than 0.10 percent at 14 days. Include ASTM C1260 and ASTM C1293 test results to demonstrate that mitigation of alkali-silica reaction by ASTM C1567 is suitable. See Figure 3 of ASTM C1778 for reactivity of aggregates where ASTM C1567 testing is not recommended.
 3. Fine aggregate:
 - a. Material graded such that 95 to 100 percent of material passes the No. 4 (4.75 mm) sieve, when sampled in accordance with ASTM D75 and D3665, and tested in accordance with ASTM C136.
 - b. Provide fine aggregate consisting of clean, natural sand, or sand prepared from crushed stone or crushed gravel.
 - c. In accordance with ASTM C33 requirements for grading, deleterious substances, soundness, and alkali reactivity, except as modified in the following paragraphs:
 - 1) Grading: For sieve sizes listed in ASTM C33 for fine aggregate, not more than 45 percent passing any sieve and retained on the next consecutive sieve.
 - 2) Deleterious substances: Not in excess of the percentages by weight specified in Table 1 of this Section.

Table 1: Fine Aggregate, Limits on Deleterious Substances

Item	Test Method	Percent (maximum)
Materials finer than No. 200 sieve ⁽²⁾	ASTM C117	3.00 ⁽²⁾
Clay lumps and friable particles	ASTM C142	1.00
Lightweight particles (SG < 2.40)	ASTM C123	1.00

Table 1: Fine Aggregate, Limits on Deleterious Substances

Item	Test Method	Percent (maximum)
• Chert or shale ⁽¹⁾	ASTM C295	1.00 ⁽¹⁾
Coal and lignite	ASTM C123	0.50

Notes:

- (1) ASTM C123 tests for particles in the sample having a specific gravity less than 2.40. ASTM C295 is used to identify which of those lightweight particles are chert, shale, or coal and lignite. If testing under ASTM C123 indicates a combined percentage of lightweight particles (sum of shale, chert, coal and lignite) not greater than 1.00, testing under ASTM C295 will not be required.
- (2) For manufactured sand, if material finer than the No. 200 sieve consists of crusher dust and the aggregate is essentially free of clay or shale, maximum percentage may be increased to 5.0 percent.

- 3) Organic impurities: Free of injurious amounts of organic matter and producing a supernatant liquid with color not darker than “standard color” when tested in accordance with ASTM C40.
- 4) Soundness: In accordance with requirements of ASTM C33 when tested in accordance with ASTM C88 using sodium sulfite solution.
4. Coarse aggregate:
- a. Materials graded such that not more than 10 percent of material passes the 3/8-inch sieve, when sampled in accordance with ASTM D75 and D3665 and tested in accordance with ASTM C136.
 - b. Consisting of gravel, crushed gravel, crushed stone, or a combination of these materials having clean, hard, durable particles free from calcareous coatings, organic matter, or other deleterious substances.
 - c. Conforming to the requirements of ASTM C33, Class 4S for physical properties, deleterious substances, and alkali reactivity, except as modified in the following paragraphs:
 - 1) Grading:
 - a) Size number as specified in ASTM C33, and as indicated in Table 3 of this Section, except as otherwise specified or accepted by the Engineer.
 - b) Weights of flat or elongated particles (particles having a length greater than 3 times average width or thickness) not exceeding 15 percent when tested in accordance with ASTM D4791.
 - 2) Deleterious substances: Not in excess of the percentages by weight specified in Table 2 of this Section and having total of all deleterious substances exceeding 2 percent.

Table 2: Coarse Aggregate, Limits on Impurities

Item	Test Method	Percent (maximum)
Clay lumps and friable particles	ASTM C142	0.50
Lightweight particles (SG < 2.40)	ASTM C123	1.25
	• Chert or shale ⁽¹⁾	ASTM C295
Materials finer than No. 200 sieve	ASTM C117	0.50 ⁽²⁾
Coal and lignite	ASTM C123	0.25

Notes:

- (1) ASTM C123 tests for particles in the sample having a specific gravity less than 2.40. ASTM C295 is used to identify which of those lightweight particles are chert, shale, or coal and lignite. If testing

Table 2: Coarse Aggregate, Limits on Impurities

Item	Test Method	Percent (maximum)
<p>under ASTM C123 indicates a combined percentage (sum of shale, chert, coal and lignite) not greater than 1.25, testing under ASTM C295 will not be required.</p> <p>(2) When material finer than No. 200 sieve consists of crusher dust, maximum percentage may be increased to 1.00 percent. When mix design complies with provisions of ASTM C33, Table 4, footnote C, the maximum percentage may be increased in accordance with the equation in footnote C, up to a maximum of 1.5 percent.</p>		

- 3) Abrasion loss: Loss not greater than 45 percent after 500 revolutions when tested in accordance with ASTM C131.
- 4) Soundness: Loss not greater than 10 percent when tested in accordance with ASTM C88 using sodium sulfate solution.

2.04 MATERIALS FOR PLACING, CURING AND FINISHING

A. General:

- 1. Materials shall be compatible with concrete and with other materials.
- 2. Materials for placing, curing and finishing concrete that will be in contact with potable water:
 - a. Non-toxic and shall not impart taste or odor to the water.
 - b. Listed under NSF-61 for use in contact with potable water.

B. Cement grout:

- 1. Use: For spreading over surface of construction and cold joints in concrete before placing additional concrete above those joints.
- 2. As specified in Section 03600 - Grouting.

C. Evaporation retardant:

- 1. Tested and listed under NSF-61 for use direct contact with potable water.
- 2. Use: For mitigating surface moisture evaporation from freshly placed concrete during rapid drying conditions. Placed after screeding.
- 3. Waterborne, monomolecular, spray-applied compound, with fugitive dye to indicate coverage.
- 4. Manufacturers: One of the following, or equal:
 - a. Euclid Chemical Co., Eucobar.
 - b. Master Builders Solutions/Sika, MasterKure ER 50.

D. Nonslip abrasive:

- 1. Aluminum oxide abrasive size 8/16, having structure of hard aggregate that is, homogenous, nonglazing, rustproof, and unaffected by freezing, moisture, or cleaning compounds.
- 2. Manufacturers: One of the following, or equal:
 - a. Abrasive Materials, Inc.
 - b. Exolon Co.
 - c. "Non-Slip Aggregate", Euclid Chemical Co.

E. Plastic membrane for curing:

- 1. Polyethylene film: In accordance with ASTM C171.
- 2. Properties:
 - a. Color: White.

- b. Thickness: Nominal thickness of polyethylene film shall not be less than 0.0040 inches when measured in accordance with ASTM D2103. Thickness of polyethylene film at any point shall not be less than 0.0030 inches.
 - c. Loss of moisture: Not exceed 0.055 grams per square centimeter of surface when tested in accordance with ASTM C156.
- F. Sprayed membrane curing compound:
- 1. Tested and listed under NSF-61 for use direct contact with potable water.
 - 2. Combination curing and sealing products (“cure and seal”) will not be permitted.
 - 3. Properties:
 - a. Clear type with fugitive dye conforming with ASTM C309, Type 1D and containing no wax, paraffin, or oils.
 - b. For concrete placed or cured during hot weather, curing compound shall be as specified, except that:
 - 1) It shall include a white, reflective fugitive dye.
 - 2) Moisture loss during a 72-hour period shall not exceed 9 pounds per cubic yard when tested in accordance with ASTM C156.
- G. Surface-applied sealing system:
- 1. Tested and listed under NSF-61 for use direct contact with potable water.
 - 2. Manufacturers: One of the following, or equal:
 - a. Euclid Chemical Co., Vandex Super.
 - b. Kryton International, Inc., Krystol T1.
 - c. Xypex Chemical Corp., Xypex Concentrate.
 - 3. Where surface-applied sealing system is placed over concrete containing permeability reducing admixture for concrete exposed to hydrostatic conditions (PRAH), provide products of same manufacturer providing the admixture.

2.05 EQUIPMENT

- A. General:
- 1. Provide adequate equipment and facilities for accurate measurement and control of materials and for readily changing proportions of material into mixers.
- B. Batching equipment, or batch plant.
- 1. Capable of controlling delivery of all material to mixer within 1 percent by weight of individual material.
- C. Mixing equipment:
- 1. Mixers may be of stationary plant, paver, or truck mixer type, as appropriate to the Work.
 - 2. Capable of combining aggregates, water, and cementitious materials, and admixtures within specified time into a thoroughly mixed and uniform mass, and of discharging the mixture without segregation.
 - a. Maintain concrete mixing equipment in good working order, and operate at loads, speeds, and timing recommended by manufacturer or as specified.
 - b. Proportion cementitious materials and aggregate by weight.

3. If bulk cementitious materials are used, weigh them on separate visible scale which will accurately register scale load at any stage of weighing operation from zero to full capacity.
 4. Prevent cementitious materials from coming into contact with aggregate or with water until materials are in mixer ready for complete mixing with all mixing water.
 5. Procedure of mixing cementitious materials with sand or with sand and coarse aggregate for delivery to project site, for final mixing and addition of mixing water will not be permitted.
 6. Retempering of concrete will not be permitted.
 7. Discharge entire batch before recharging.
 8. Volume of mixed material per batch: Not exceed manufacturer's rated capacity of mixer.
 9. Equip each mixer with device for accurately measuring and indicating quantity of water entering concrete, and operating mechanism such that leakage will not occur when valves are closed.
 10. Equip each mixer with device for automatically measuring, indicating, and controlling time required for mixing:
 - a. Interlock device to prevent discharge of concrete from mixer before expiration of mixing period.
 11. Transit-mixed concrete:
 - a. Mix and deliver in accordance with ASTM C94.
 - b. Total elapsed time between addition of water at batch plant and discharging completed mix.
 - c. Not to exceed 90 minutes.
 - d. Elapsed time at project site shall not exceed 30 minutes.
 - e. Under conditions contributing to quick setting, total elapsed time permitted may be reduced by the Engineer.
 - f. Equip each truck mixer with device interlocked to prevent discharge of concrete from drum before required number of turns and furnish device that is capable of counting number of revolutions of drum.
 12. Continuously revolve drum after it is once started until it has completely discharged its batch:
 - a. Do not add water until drum has started revolving.
 - b. Right is reserved to increase required minimum number of revolutions or to decrease designated maximum number of revolutions allowed, if necessary, to obtain satisfactory mixing. Contractor will not be entitled to additional compensation because of such increase or decrease.
- D. Other types of mixers: For other types of mixers, mixing shall be as follows:
1. Mix concrete until there is uniform distribution of materials, and discharge mixer completely before recharging.
 2. Neither speed nor volume loading of mixer shall exceed manufacturer's recommendations.
 3. Continue mixing for minimum of 1-1/2 minutes after all materials are in drum, and for batches larger than 1 cubic yard increase minimum mixing time 15 seconds for each additional cubic yard or fraction thereof.

2.06 CONCRETE MIXES

A. General:

1. Develop and provide mix design for each Concrete Class listed in Table 3 of this Section.
2. Select and proportion mixes and document properties using 1 of the 2 methods that follow. Procedures and requirements for use of each alternative are specified in subsequent paragraphs of this Section.
 - a. Field experience method.
 - b. Trial batch method.
3. Organize and submit mix designs with data on all constituent materials and products for that mix for Engineer's review.
4. Do not place concrete until the mix design for that Concrete Class has been accepted by Engineer.
5. After acceptance, do not modify accepted mixes or provide new mixes without Engineer's prior review and acceptance of the proposed alternative.
 - a. Exception: At all times, adjust batching of water to compensate for free moisture content of the fine aggregate used.
 - b. For any change to approved mixes, Engineer may require new trial batching and testing program as specified in this Section before acceptance and use.
 - c. For any change to approved mixes, make modifications within limits set forth in this Section.
 - d. If there is change in source or quality of any constituent of the concrete class or mix, the revised mix will be considered a new class of concrete and shall require full re-submittal of all data describing mix constituents, design, and testing.
6. Material sampling, mix designs, trial batch preparation and testing, modifications to mix designs, and any re-testing required to satisfy the requirements of this Section or to obtain satisfactory performance shall be at Contractor's expense and shall not be considered cause for delay.

B. Measurements of materials:

1. Measure materials by weighing, except as otherwise specified or where other methods are specifically authorized in writing by the Engineer.
2. Furnish apparatus for weighing aggregates and cementitious materials that is suitably designed and constructed for this purpose.
3. Accuracy of weighing devices: Furnish devices that have capability of providing successive quantities of individual material that can be measured to within 1 percent of desired amount of that material.
4. Measuring or weighing devices: Subject to review by the Engineer. Shall bear valid seal of the Sealer of Weights and Measures having jurisdiction.
5. Weighing cementitious materials:
 - a. Weigh cementitious materials separately.
 - b. Cement in unbroken standard packages (sacks): Need not be weighed.
 - c. Weigh bulk cementitious materials and fractional packages.
6. Measure mixing water by volume or by weight.

- C. Requirements for mix proportioning:
1. Develop and provide mixes that:
 - a. Can be readily worked into corners and angles of forms and around reinforcement, without excessive vibration, and without permitting materials to segregate or free water to collect on surface.
 - b. Prevent unnecessary or haphazard changes in the consistency of the concrete supplied.
 2. Constituent materials:
 - a. Provide concrete mixes composed of Portland cement or blended cement, blended aggregates, admixtures and water.
 - 1) Admixtures required for each concrete class are indicated in Table 3 of this Section. Admixtures not specifically required by that table for a specific Concrete Class are optional and may be included at the discretion of the Contractor based on Contractor's planned means and methods of construction.
 - b. In no case shall returned fresh concrete or its constituents be incorporated into concrete batched for the Work.
 3. Minimum specified compressive strength:
 - a. Minimum specified compressive strength is designated at 28 days, unless otherwise indicated in Table 3 of this Section.
 - b. For locations where the placed concrete is adequately protected and is not subjected to loads for an extended period during construction, the Contractor may request that the period for achieving the minimum specified compressive strength be extended to 56 days. If accepted by the Engineer, provide mixes that achieve at least 75 percent of their minimum specified compressive strength after 28 days.
 4. Proportions and consistency:
 - a. Ratio of water to cementitious materials, and cementitious materials content:
 - 1) Conform to maximum and minimum cementitious material content requirements specified in Table 3 of this Section.
 - 2) Cementitious materials content: Consisting of Portland cement or blended cements indicated in Table 3 of this Section, plus supplemental cementitious materials if aggregate testing indicates potentially reactive aggregates:
 - a) Fly ash content:
 - (1) Minimum: 15 percent of the total weight of cementitious materials.
 - (2) Maximum: 25 percent of the total weight of cementitious materials.
 - (3)
 - b) Slag cement content:
 - (1) Minimum: 20 percent of the total weight of cementitious materials.
 - (2) Maximum: 30 of the total weight of cementitious materials.
 - c) Silica fume content:
 - (1) Minimum: 4 percent of the total weight of cementitious materials.
 - (2) Maximum: 15 of the total weight of cementitious materials.

- b. Aggregate size and content:
 - 1) Blend aggregates to produce an optimized gradation that combines well-graded coarse, and fine aggregates in proportions that maximize the aggregate content of the mix, and that minimize the cement paste content of the mix.
 - a) Percentage of individual fractions of the combined aggregate gradation retained on individual sieve sizes: Within the range shown in Attachment C - Combined Aggregate Gradation Chart ("Tarantula Curve").
 - b) Sum of the percentages of individual fractions retained on the No. 8, No. 16, and No. 30 sieves: Greater than 20 percent.
 - c) Sum of the percentages of individual fractions retained on the No. 30, No. 50, No. 100, and No. 200 sieves: Within the range of 25 percent to 40 percent.
- c. Determine bulk density and void content of the combined gradation of aggregates in accordance with ASTM C29. Results for combined aggregates shall not be the summation of results of testing of the individual gradations.
 - 1) Sample the combined aggregate from a flowing aggregate stream or conveyor in accordance with ASTM D75. Take care to ensure that the sample is representative of the proportions of the combined aggregate of the proposed mix.
 - 2) Reduce sample of combined aggregate to test sample size in accordance with ASTM C702, Method A - mechanical splitter or Method B - quartering.
 - 3) Perform bulk density test of combined aggregate in accordance with ASTM C29, Procedure A - rodding.
 - 4) Determine void content of the combined aggregate in accordance with ASTM C29, Procedure A - rodding. Specific gravity of the combined aggregate shall be determined in accordance with ASTM C136.
- d. Paste content: Limited to the following:
 - 1) Class A mixes without air entrainment: Maximum 28 percent measured by volume.
 - 2) Class A mixes with air entrainment: Maximum 28 percent measured by volume plus the target air content.
 - 3) Paste content shall be limited to 175 percent of the void content of the combined aggregate gradation determined by ASTM C29.
- e. Total water content:
 - 1) Not exceeding the water to cementitious material ratio specified in Table 3 of this Section.
 - 2) Not exceeding 245 pounds of water per cubic yard of concrete for Class A mix.
- f. Coarseness/workability (Shilstone Method):
 - 1) Proportion mixes to fall into the "Optimal" zone (Zone II) when plotted on the Coarseness Factor Chart ("Coarseness Factor" versus "Workability Factor") included as Attachment B - Coarseness Factor Chart to this Section. Provide plot for each Class A mix to be used in the Work.

- 2) Coarseness factor (CF) for each mix shall be calculated as the percent of the combined aggregate gradation retained on the 3/8 inch sieve, divided by the percent of the combined aggregate gradation retained on the Number 8 sieve, multiplied by 100, or:

$$CF = \frac{(\% \text{ retained on } 3/8 \text{ in sieve})}{(\% \text{ retained on No. 8 sieve})} \times 100$$

- 3) Workability factor (WF) for each mix shall be the percent of the combined aggregate gradation retained on the Number 8 sieve, adjusted for cement content in the mix.
- Determine volume of total cementitious material in the mix.
 - For each 94 pounds of cement content above 564 pounds per cubic yard, increase workability factor by 2.5 units.
 - For each 94 pounds of cement below 564 pounds per cubic yard, decrease workability factor by 2.5 units.
 - Proportion adjustment factor by linear interpolation for each fraction of 94 pounds above or below the 564 pound basis.
 - Example:
650 pounds per cubic yard = 564 pounds + 86 pounds.
Adjustment = (86 lb / 94 lb) x 2.5 = + 2.28.

D. Concrete Classes for use in the Work:

- Provide concrete classes listed in Table 3 of this Section.
- Provide normal weight concrete, having minimum weight of 140 pounds per cubic foot, unless otherwise noted.
- Pumped concrete:
 - Provide pumped concrete that complies with all requirements of this Section.
 - Mixes placed by pumping shall be considered a sub-class of each concrete class listed in Table 3 of this Section. Prepare and submit a separate mix design for each mix to be placed by pumping.
- Class PM concrete: In addition to the requirements of Table 3 of this Section, conform to the following:
 - Minimum 28 day flexural strength: 650 psi when tested in accordance with ASTM C293.
 - Cementitious materials content: 75 percent Portland cement plus 25 percent Class F fly ash (by weight), blended cement conforming to Type IP(25), or 75 percent Type IL blended cement plus 25 percent Class F fly ash (by weight).
 - Aggregate:
 - Minimum 55 percent coarse aggregate conforming to ASTM C33 size number 357 or size number 467.
 - Substitute ASTM C33 size number 57 or size number 67 if mechanical paving equipment is not used.

Table 3: Concrete Classes

Concrete Class ⁽¹⁾	Minimum Specified Compressive Strength at 28 days, f _c ⁽²⁾ (pounds per square inch)	Ratio of water to cementitious materials ⁽³⁾ (minimum - maximum).	Cementitious Materials Content (pounds per cubic yard of concrete by weight) ⁽⁴⁾	Cement Type	Maximum Chloride Content (percent by weight of cement)	Maximum Size of Coarse Aggregate (ASTM C33)	Air Entrainment (percent), (n/a: not applicable)	Admixtures required ^(4,5,6)	Slump Range (inches)
A	4,500	0.40 to 0.42	535 to 575	ASTM C150, Type II(MH) or ASTM C595, Type IL(<15)(MS) or IP(20)(MS)	0.10	#57	6±1.5	AEA WRA	2 to 4

Notes:

- (1) Sub classes within major concrete classes are designated as follows:
NA: Without air entrainment.
- (2) At locations where concrete will not be subjected to load from other elements of the structure or from Contractor's placing and/or backfilling operations, maximum time period for achievement of specified compressive strength may be extended to 56 days when accepted by the Engineer.
- (3) W/C Ratio = Ratio of water to cementitious materials by weight. Include weight of admixtures in the water content of the mix when the quantity of the admixtures exceeds 10 ounces per 100 pounds of cement.
- (4) Cementitious material includes Portland cement plus supplemental cementitious materials. If trial batch testing demonstrates that the required strength cannot be met at 28 or 56 days with the specified combined aggregate gradation and the paste content limits, cementitious material content may be increased with Engineer's approval if Class M concrete is provided and Thermal Control Plan and Temperature Monitoring Program in accordance with Section 03703 - Thermal Control of Concrete is provided for cast-in-place concrete elements. Cement content and/or threshold for the thermal control requirement may be adjusted by the Engineer based on the Equivalent Cement Content (ECC) of the approved Class M concrete mix.
- (5) Admixtures are designated as follows:
AEA: Air entraining admixture.
HRWR: High-range water-reducing admixture.
PRAH: Permeability-reducing admixture for concrete exposed to hydrostatic conditions.
SFR: Synthetic fiber reinforcement.
SRA: Shrinkage-reducing admixture.
WRA: Water-reducing admixture.
- (6) At Contractor's option, each concrete class may include a high-range water reducing admixture (HRWR). Designate such mixes as the "class" specified followed by "SP" (e.g., A-SP, A-NA-SP, P-SP, etc.). Submit as separate mixes for review. Slump range after addition of HRWR: 4 to 6 inches.

- E. Install Concrete Classes in accordance with the following requirements unless otherwise indicated on the Drawings.
1. Class A concrete: Structural concrete.
 - a. Use Class A concrete at all locations unless other Classes are specified or indicated on the Drawings.

2. Class A-NA concrete: Structural concrete without air entrainment.
 - a. Class A-NA concrete may be used in lieu of Class A at indoor slabs (not subject to freezing and thawing) where inclusion of an air-entraining admixture makes it difficult to achieve the specified concrete finish.
 3. Class C concrete: Miscellaneous concrete fill and encasement.
 - a. Class C concrete may be used for fill for unauthorized excavation, for thrust blocks and ground anchors for piping, for bedding of pipe, and where indicated on the Drawings.
 4. Class CE concrete: Use Class CE for electrical conduit encasements.
- F. Concrete mix design documented by field experience:
1. Mix design:
 - a. Prepare preliminary mix design for each Concrete Class. Submit mix design with product and testing data for materials to be used in the mix for Engineer's review.
 2. Historical records for similar mix.
 - a. Determinations of similarity of materials and proportions between historical and proposed mixes shall be by the Engineer, and that shall be final.
 - b. Historical record - Materials:
 - 1) Submit with each mix design the following data for a previously-supplied concrete mix similar to that proposed for this Work.
 - 2) Records demonstrating that the previously supplied mix included similar materials and proportions as those of the proposed mix.
 - a) Documentation that the same concrete supplier will provide both mixes.
 - b) Documentation that the materials used was from the same suppliers and had essentially the same properties, demonstrated by test data, as those proposed.
 - c) Documentation that proportions of materials in the record mix are essentially the same as those proposed and that the specified compressive strength of the record mix is within 1,000 pounds per square inch of that required by this Section.
 - d) Concrete supplier's statement describing any changes made to production of the record mix during the time period reported.
 - e) Concrete supplier's statement that preparation and quality control procedures for the record mix were essentially the same as those to be employed for this Work.
 - c. Historical record - Testing:
 - 1) Submit with each record mix, corresponding test data for slump, compressive strength (with relationships for rate of strength gain between testing ages), and drying shrinkage.
 - 2) Only records satisfying the following requirements will be accepted.
 - a) All tests were conducted within a period of 1 year preceding the date of the Submittal.
 - b) All tests were conducted over a period including not less than 45 days.
 - c) Record of compressive strength testing includes at least 30 tests for slump and 28-day compressive strength.

- d) Record of compressive strength tests is consecutive. In other words, it includes all tests conducted on the subject mix within the 1-year time period described above (not just selected tests during that period).
 - e) Submit concrete supplier's sworn statement confirming that all tests for the record mix have been reported.
 - f) Tests for drying shrinkage are described in subsequent paragraphs of this Section for "concrete mix design documented by trial batch preparation and testing".
 - g) Provide supplementary testing if requested by Engineer.
 - d. For mixes determined to be similar and to have an acceptable test history, acceptance criteria shall be as follows:
 - 1) Acceptance criteria:
 - a) Slump: All tests within limits specified for record mix.
 - b) Compressive strength: Average compression strength for tests, as determined by ACI CODE-350 not less than minimum required average strength.
 - c) Drying shrinkage: Within limits stated in subsequent paragraphs of this Section for "concrete mix design documented by trial batch preparation and testing".
- G. Concrete mix design documented by trial batch preparation and testing:
- 1. Mix design and trial batches:
 - a. Prepare preliminary mix design for each Concrete Class. Submit mix design with product and testing data for each combination of materials and proportions to be used for Engineer's review.
 - 1) Determine water content of the mix based on curves showing the relation between water-cementitious materials ratio and the 7- and 28-day compressive strength of the concrete.
 - 2) Determine each curve using 4 or more points, each representing the average compressive strength value of at least 3 specimens tested at each age.
 - b. After materials and proposed mix designs have been accepted by Engineer, have trial batches for each concrete mix design prepared by Contractor's testing laboratory.
 - 1) Prepare trial batches using the cementitious materials, aggregates, and admixtures proposed to be used for the Work.
 - 2) Provide batches of sufficient quantity to determine slump, workability, consistency, setting time, and finishing characteristics, and to provide sufficient specimens for testing.
 - c. For each trial batch, make and test specimens to determine and report slump, compressive strength (with relationships for rate of strength gain between testing ages), and drying shrinkage.
 - 1) If trial batches do not produce concrete conforming to the specified requirements for slump, strength, workability, consistency, drying shrinkage, restrained shrinkage, and finishing, change mix proportions and, if necessary, sources of materials.
 - 2) Make additional trial batches and perform additional tests until a batch that conforms to requirements of this Section is produced.

2. Testing - Slump:
 - a. Determine slump in accordance with ASTM C143.
 - b. Acceptance criterion: Slump within range specified.
3. Testing - Compressive strength:
 - a. Prepare 4 inch diameter by 8 inch long cylinders in accordance with ASTM C31 for tests specified in this Section.
 - b. Determine average compressive strength:
 - 1) Test at least 12 cylinders from each trial batch for compressive strength in accordance with ASTM C39.
 - 2) Test 4 cylinders at 7 days, another 4 at 28 days, and another 4 at 56 days.
 - 3) Calculate average compression strength for 7 day tests, for 28 day tests, and for 56 day tests.
 - 4) Calculate ratios for:
 - a) Average 7 day strength to average 28 day strength.
 - b) Average 28 day strength to average 56 day strength.
 - c. Determine the required average compressive strength for each mix, f'_{cr} , as described in the following paragraphs:
 - 1) Calculate required average compressive strength (f'_{cr}) based on the minimum specified 28-day compressive strength, f'_c , plus a standard deviation determined from the test history available for that mix.
 - 2) Determine f'_{cr} as specified in ACI CODE-350, except as modified in the following paragraphs:
 - a) Where 15 or more 28-day compressive strength tests are available, calculate standard deviation as described in the preceding paragraphs for "concrete mix design documented by field experience". Add this standard deviation to the specified minimum compressive strength to determine the required average compressive strength (f'_{cr}) for the mix.
 - b) Where fewer than 15 compressive strength tests at 28 days are available, determine minimum required compressive strength, (f'_{cr}) from Table 4 of this Section.

Minimum Specified Compressive Strength, f'_c (pounds per square inch)	Required Average Compressive Strength, f'_{cr} (pounds per square inch)
Less than 3,000	$f'_c + 1,000$
3,000 to 5,000	$f'_c + 1,200$
Over 5,000	$f'_c + 1,400$

- d. Acceptance criterion: Average compressive strength of the 4 cylinders tested at 28 days, or of the 4 cylinders tested at 56 days when permitted by the Engineer, shall equal or exceed the required average compression strength, f'_{cr} for that concrete mix design.

4. Testing - Chloride content:
 - a. Submit test results showing that the concrete mix contains water-soluble chloride ion content contributed from the constituents including water, aggregates, cementitious materials, and admixtures is less than the limit specified in Table 3 of this Section. Test shall be performed in accordance with ASTM C1218 at age between 28 and 42 days.
5. Testing - Drying shrinkage - Prism specimens:
 - a. Class A (including A, A-NA, A-SP, and A-NA-SP) and Class PM: From trial batch for each mix, prepare 10 drying shrinkage specimens in accordance with ASTM C157 Divide specimens into 2 groups of 5 specimens each: 1 group including shrinkage-reducing admixture, and 1 group without shrinkage-reducing admixture.
 - b. Prepare, cure, and test both groups in accordance with ASTM C157, except as modified in the following paragraphs.
 - 1) Remove drying shrinkage specimens from molds at age of 23 hours, plus or minus 1 hour, after trial batching.
 - a) Immediately place them in lime-saturated water maintained at 73 degrees Fahrenheit, plus or minus 3 degrees, for at least 30 minutes.
 - b) Remove specimens from the water and wipe with a damp cloth.
 - c) Measure to nearest 0.0001 inch to determine original length.
 - d) Record measurements and re-submerge specimens in lime-saturated water at 73 degrees Fahrenheit, plus or minus 3 degrees, for moist curing.
 - 2) Maintain submerged curing conditions at 73 degrees Fahrenheit, plus or minus 3 degrees, for 7 days. 7 days after batching, remove specimens from water and repeat measuring procedures.
 - 3) Immediately store specimens in a humidity controlled room maintained at 73 degrees Fahrenheit, plus or minus 3 degrees, and at 50 percent relative humidity plus or minus 4 percent for remainder of the test.
 - 4) At periods of 14, 21, 28, and 56 days after batching, remove specimens from curing room and repeat measurements.
 - c. Drying shrinkage test report:
 - 1) Report measurements of all specimens at 1, 7, 14, 21, 28, and 56 days after batching.
 - 2) Using measured length at 7 days as base length for drying shrinkage, calculate the following for each measuring period:
 - a) Drying shrinkage of each specimen. Determine as difference between the 7-day base length and measured length for each period.
 - b) Average of these differences. If drying shrinkage of any specimen departs from the average of the measurements for each period by more than 0.0004 inch, disregard results obtained from that specimen.
 - c) Percentage of drying shrinkage from batching to date of measurement.
 - d. Drying shrinkage acceptance criteria:
 - 1) Average shrinkage of trial batch concrete specimen group at 28 days after batching, when measured and cured as indicated, shall not exceed 0.035 percent.

- e. Mixes accepted by Engineer:
 - 1) Retain drying shrinkage test specimens. Bag in re-sealable plastic bags and submit to Engineer.
 - 2) Indicate trial batch identifier, specimen number, and date of final measurements on each specimen bag.
- 6. NSF-61 certification:
 - a. Contact NSF International to obtain certification to NSF-61.
 - 1) Provide cylinders in sufficient quantity for testing.

2.07 SOURCE QUALITY CONTROL

- A. Sample and test materials in accordance with the following requirements:
 - 1. Sampling, testing, and reporting frequency:
 - a. In preparation for mix design submittals and trial batch tests.
 - b. Whenever there is a change in source of the material, or a significant change in the characteristics or quality of materials from the same source.
 - c. For each 10,000 cubic yards of concrete mix produced.
 - d. At intervals not exceeding 90 calendar days, unless otherwise specified in the following paragraphs.
 - 2. Supplemental cementitious materials.
 - a. Sample and test fly ash in accordance with ASTM C311.
 - 3. Aggregate:
 - a. Sample combined aggregate in accordance with ASTM D75 and D3665, and test for gradation in accordance with ASTM C136.
 - b. At least once every 30 days, and when requested by the Engineer.
 - c. Submit test results.
 - 4. Cementitious materials:
 - a. Sample and test cementitious materials and provide mill certificates demonstrating compliance with ASTM C150 or ASTM C595, and additional requirements of this Section.
 - 1) Determine alkali content by method set forth in ASTM C114.
 - b. At least once every 90 days, and when requested by the Engineer.
 - c. Submit test results.
- B. Batch materials in accordance with the following requirements:
 - 1. Concrete batch weights: Control and adjust so as to secure maximum yield, and at all times maintain proportions of concrete mix within specified limits.
 - 2. Aggregates:
 - a. Obtain aggregate from a source capable of providing uniform quality, moisture content, and grading during any single day's operation.
 - b. Furnish satisfactory means at batching plant for checking moisture content of fine aggregate for each batch.
 - 3. Admixtures:
 - a. Batch solutions using mechanical batcher capable of accurate measurement.
 - b. Air entraining admixture: Add to batch in portion of the mixing water, unless otherwise recommended by the admixture manufacturer.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prepare and submit mix designs for each Concrete Class indicated in Table 3 of this Section.
- B. Submit proposed sequence of concrete placements. After acceptance, adhere to proposed sequence of placing concrete, except when specific changes are requested by the Contractor and accepted by the Engineer.
 - 1. Use construction methods and sequence work to allow concrete placement to reach adequate strength and to be constructed with required support to prevent overstress of the concrete structure during construction.
- C. Make provisions for monitoring weather conditions:
 - 1. Install an outdoor weather station capable of measuring and recording ambient temperature, wind speed, and humidity. Furnish instruments accurate to within 2 degrees Fahrenheit, 5 percent relative humidity, and 1 mile per hour wind speed.
 - 2. Monitor the weather forecast beginning at least 48 hours prior to any concrete placement and make provisions for cold weather concreting or hot weather concreting if those conditions exist or are forecast to exist during the period of placement, finishing, and curing.
 - a. Record temperature, relative humidity, and wind speeds for each placement beginning at least 24 hours before scheduled delivery of concrete.
- D. Place no concrete without Engineer's prior acceptance of conditions.
- E. Notify the Engineer in writing that preparations are complete and ready for placement of concrete. Such notification shall indicate readiness - not just intention - to place concrete for the designated portion of the Work.
 - 1. Submit notification to Engineer on forms provided by or acceptable to the Engineer and bearing the signature of Contractor's superintendent.
 - a. Sample form is included at the end of this Section, see Attachment B - Coarseness Factor Chart.
 - 2. Submittal of notification will be Contractor's certification that preparations are complete and in accordance with the Contract Drawings and Specifications.
 - 3. Provide notification for Engineer to make final observations at the locations of concrete placements not less than 24 hours before commencing placement of concrete.

3.02 CONCRETE JOINTS

- A. Locations of joints are indicated on the Drawings.
 - 1. In order to preserve strength and watertightness of structures, make no other joints, except as authorized by the Engineer.
 - 2. Construct joints where indicated, and as indicated on the Drawings.
 - 3. Where joint locations are not indicated on the Drawings, submit Contractor's proposed locations for Engineer's review and acceptance. Provide construction joints in slabs and walls at intervals not greater than 35 feet.

- B. Time between placements of adjacent concrete separated by joints.
 - 1. Provide not less than 3 days (72 hours) between placement of adjacent sections for the following:
 - a. Slabs.
 - b. Walls.
 - 2. Provide not less than 7 days (168 hours) between placement of the lower and upper pours for the following:
 - a. Walls over slabs.
 - b. Slabs over walls.
 - c. Slabs keyed into the sides of walls.

- C. Edges of joints:
 - 1. Provide joints have edges detailed as indicated on the Drawings.
 - 2. Protect wall and slab surfaces at edges from concrete splatter. Thoroughly clean adjacent surfaces after completion of each placement.

- D. Joint construction:
 - 1. Preparation of forms:
 - a. Provide cleanout holes at base of each wall and column for inspection and cleaning.
 - b. Wash forms and adjacent joint surfaces of sawdust, chips, and other debris after forms are built, and immediately before concrete or grout placement.
 - c. Should formwork confine sawdust, chips, or other loose matter in such manner that it is impossible to remove them by flushing with water, use a vacuum cleaner for their removal, and then flush cleaned surfaces with water.
 - 2. Before placing concrete against previously placed concrete, thoroughly clean the prior placement of laitance, grease, oil, mud, dirt, curing compounds, mortar droppings, or other objectionable matter by means of pressure washing.
 - 3. Provide and install waterstops, expansion joint material, and other similar materials as indicated on the Drawings and as specified.
 - a. Take special care to ensure that waterstops are secured in proper position.
 - b. Take special care to ensure that concrete is well consolidated around and against waterstops during placement.
 - 4. Horizontal joints:
 - a. As initial placement over cold joints, thoroughly spread bed of cement grout as specified in Section 03600 - Grouting.
 - 1) Thickness: Not less than 1/2 inch or more than 1 inch.
 - b. For wall placements above planned cold joints, placement of cement grout will not be required for locations where the wall mix includes high-range water-reducing admixture ("superplasticizers"), and the Contractor can demonstrate dense concrete joints without voids or honeycomb after the forms are removed.

3.03 MEASURING AND BATCHING MATERIALS

- A. Measurements of materials:
 - 1. Proportion and measure cementitious materials and aggregates by weight.
 - a. Weigh cementitious materials separately.
 - b. If bulk cementitious materials are used, weigh them on separate visible scale that will accurately register scale load at any stage of weighing operation from zero to full capacity.
 - c. Cement in unbroken standard packages (sacks) need not be weighed.
 - 2. Mixing water: Measure by volume or by weight.
 - 3. Other mix constituents: Measure by weight, except as otherwise specified or accepted by the Engineer.
 - 4. Weighing and measuring devices:
 - a. Use equipment designed and constructed specifically for that purpose.
 - b. Furnish devices capable of weighing successive quantities of individual material measured to within 1 percent of desired weight of that material.
 - c. Bearing valid seal of the department of weights and measures for the authority having jurisdiction over the Work.
 - 5. Measurements and measuring devices:
 - a. Subject to review by the Engineer.
- B. Batching:
 - 1. Admixtures shall be added at the concrete batch plant.
 - 2. Addition of admixtures in the field is permitted only with prior acceptance by the Engineer, and only when the following conditions are satisfied:
 - a. Dosage and mixing is personally overseen by concrete supplier's trained technologist.
 - b. Adequate mixing is provided after addition.
 - c. Maximum time to placement of concrete remains 90 minutes after water added to mix - not 90 minutes after any field additions/adjustments.
 - d. Slump at discharge after additions/modifications conforms to the requirements of Table 3 of this Section.

3.04 MIXING AND TRANSPORTING

- A. Machine mixing:
 - 1. Prevent cementitious materials from coming into contact with aggregate or with water until materials are in mixer and ready for complete mixing with all mixing water.
 - 2. Procedure of mixing cementitious materials with sand, or with sand and coarse aggregate, for delivery to project site for final mixing and addition of mixing water is not permitted.
 - 3. Remixing of concrete that has started to take its initial set ("retempering") is not permitted.
 - 4. Discharge entire batch before recharging.
 - 5. Volume of mixed material per batch: Not exceeding manufacturer's rated capacity of mixer.

- B. Transit-mixed concrete:
1. Mix and deliver in accordance with ASTM C94, except as modified in this Section.
 2. Total elapsed time between addition of water at batch plant and discharging completed mix:
 - a. Not to exceed 90 minutes or 300 revolutions of the mixing drum.
 - b. Under conditions contributing to rapid setting, total elapsed time permitted may be reduced by the Engineer.
 3. Temperature - minimum and maximum allowable during mixing and transporting:
 - a. Minimum: 50 degrees Fahrenheit.
 - b. Maximum: 90 degrees Fahrenheit.
 4. Continuously revolve drum after it is started until it has completely discharged its batch.
 - a. Do not add water until drum has started revolving.
 - b. Engineer reserves the right to increase required minimum number of revolutions or to decrease designated maximum number of revolutions allowed, if necessary, to obtain satisfactory mixing. Contractor will not be entitled to additional compensation because of such increase or decrease.
- C. Concrete delivery:
1. Furnish to the Engineer a delivery ticket for each batch of ready mixed concrete within 24 hours after delivery. Include the following information on each ticket:
 - a. Time of day concrete was batched, and time of day that discharge from the truck is complete.
 - b. Printed record of the individual weight of each of the following constituents in the batch: Fine aggregate, coarse aggregate, cement, pozzolan, and water.
 - c. Concrete Class as defined in Table 3 of this Section.
 - d. Type, brand, and quantity of each admixture in the batch.
 - e. Total volume of water allowed in the mix, volume of mixing water added at the batch plant, volume of mixing water withheld from the mix during batching, and total volume of any water added to the mix after leaving the batch plant.
 - 1) In no case shall volume of mixing water withheld result in a water/cementitious materials ratio less than the minimum values specified in Table 3 of this Section.
 - f. Number of revolutions of transit truck at arrival on site, and total number of revolutions when discharge is complete.
 - g. Volume of concrete delivered in the batch.
 - h. Numerical sequence of the batch delivered for that placement.
 2. Additional water may only be added to the mix when the following conditions are fully satisfied:
 - a. Batch ticket showing total volume of water already added and maximum volume of water that may be added is available for Engineer's observation before any additional water is added.
 - b. Total volume of water in the mix after the addition will be less than the maximum allowable volume of water indicated on the ticket.

- c. Full concrete load is still within the truck's mixing drum, and truck has not begun to discharge the load. Under no conditions shall water be added in the field to a partial truckload of concrete.
 - d. Volume of water added, and time of addition are clearly marked for record on the batch ticket delivered to the Engineer.
3. Addition of admixtures in the field is permitted only with prior approval by the Engineer, and when the following conditions are satisfied:
- a. Dosage and mixing is personally overseen by concrete supplier's trained technologist and admixtures supplier's representative.
 - b. Adequate mixing time is provided after addition of admixtures.
 - c. Maximum time to placement of concrete remains 90 minutes after water is added to the mix - not 90 minutes after any field additions/adjustments.
 - d. Slump at discharge after additions/modifications conforms to the requirements of Table 3 of this Section.
- D. Conveying concrete:
- 1. Convey concrete from mixer to location of final deposit by methods that prevent separation or loss of materials.
 - 2. Use equipment for chutes, pumps, and conveying of concrete of such size and design as to ensure practically continuous flow of concrete, from delivery to the point of placement, without separation of materials.
 - 3. Design and use chutes and devices for conveying and depositing concrete that direct concrete vertically downward when discharged from chute or conveying device.
 - 4. Keep equipment for conveying concrete thoroughly clean by washing and scraping upon completion of any day's placement.

3.05 PLACING AND CONSOLIDATING

- A. Preparation:
- 1. Obtain Engineer's acceptance of completed preparations before placing concrete.
 - a. Notify Engineer in writing that all preparations are complete and ready for placement of concrete. Such indication shall indicate readiness, not just intention, to place concrete for the designated portion of the Work.
 - b. Submit completed Attachment D - Contractor's Concrete Placement Checklist Form.
 - 2. Confirm completeness of the following before notification of readiness is given to Engineer:
 - a. Place forms, reinforcement, screeds, anchors, ties, and inserts in final position.
 - b. Reinforcement is secure and properly fastened in its correct position.
 - c. Loose form ties at construction joints have been retightened.
 - d. Dowels, bucks, sleeves, hangers, pipes, conduits, anchor bolts, and any other fixtures required to be embedded in concrete have been placed and adequately anchored.
 - e. Forms have been cleaned of debris and form release agents are applied as specified.
 - 3. Preparation for placement of footings and slabs on grade:
 - a. Do not place concrete on ground or compacted fill until subgrade is in moist condition acceptable to the Engineer.

- b. If necessary, sprinkle subgrade with water not less than 6 or more than 20 hours in advance of placing concrete.
 - c. If subgrade surface becomes dry prior to actual placing of concrete, sprinkle again, without forming pools of water.
 - d. Do not place concrete if subgrade is muddy or soft.
4. Keep sufficient protective coverings on hand at all times for protection of concrete during and after placement.
- a. Protect concrete placed before rain to prevent water from coming in contact with such concrete.
 - b. Protect concrete placed before winds to prevent excessive drying or embedment of debris in the finished surfaces.
- B. Concrete placement:
1. Do not place concrete:
 - a. With slump outside the limits specified in Table 3 of this Section.
 - b. In which initial set has occurred, or that has been retempered.
 - c. During rainstorms or high velocity winds.
 2. Deposit concrete at or near its final position to avoid segregation caused by rehandling or flowing.
 - a. Do not deposit concrete in large quantities in one place, and then work material along forms with vibrator or by other methods.
 3. Do not drop concrete freely into place from height greater than 5 feet. Use tremies for placing concrete where drop is over 5 feet.
 4. Place concrete on slopes starting from bottom of slope and working upward.
 5. Place concrete in horizontal lifts not exceeding 24 inches in depth and bring up evenly in all parts of forms.
 6. After concrete placement begins, continue in a continuous operation without significant interruption until the end of the placement. Plan and implement precautions to prevent any delay, between layers or adjacent volumes, from exceeding 20 minutes.
 7. If concrete is to be placed over previously placed concrete and more than 20 minutes has elapsed, spread layer of cement grout over surface before placing additional concrete. Provide grout layer thickness of not less than 1/2 inch or more than 1 inch.
 8. Placement of concrete for slabs, beams, or walkways:
 - a. If cast monolithically over walls or columns, do not commence until concrete in walls or columns has been allowed to set and shrink.
 - b. Allow set time of not less than 1 hour for shrinkage.
 - 1) During waiting time, keep top surface of concrete moist, but not wet.
 - 2) Do not permit water to pond or stand on the surface.
 - 3) Do not coat surface with evaporation retarders or curing agents.
 - c. Start placement above wall or column with layer of cement grout as described in the preceding paragraph.
- C. Consolidating concrete:
1. Consolidate concrete with aid of acceptable mechanical vibrators.
 2. Thoroughly consolidate concrete around reinforcement, pipes, or other shapes built into the Work.
 3. Provide sufficiently intense vibration to cause concrete to flow and settle readily into place and to visibly affect concrete over radius of at least 18 inches.

4. Vibrators:
 - a. Keep sufficient vibrators on hand at all times to vibrate concrete as placed.
 - b. In addition to vibrators in actual use while concrete is being placed, have on hand a minimum of 1 spare vibrator in operable condition.
 - c. Do not place concrete until it has been confirmed that all vibrating equipment, including spares, are in operable condition.
5. Place concrete solidly against forms and concrete surfaces, leaving no voids or honeycomb.
6. Make concrete solid, compact, and smooth. If for any reason surfaces or interiors have voids or are in any way defective, repair such concrete in manner acceptable to the Engineer.
7. Do not over-vibrate so as to produce segregation.

3.06 FINISHING CONCRETE

- A. Provide concrete finishes: Smooth form finish, unless otherwise indicated on the Drawings.
- B. Liquid evaporation retardant:
 1. Under conditions that result in rapid evaporation of moisture from the surface of the concrete, coat the surface of the concrete with a liquid evaporation retardant immediately after screeding.
 2. Conditions that result in rapid evaporation of moisture are defined as any combination of ambient temperature, concrete temperature, relative humidity, wind speed, and solar radiation intensity that creates conditions that will evaporate water from a free concrete surface at a rate equal to or greater than 0.1 pounds per square foot per hour as determined by the Menzel Formula and nomograph published in ACI PRC-305 and included as Attachment A - Menzel Formula and Nomograph to this Section.
 3. Apply evaporation retardant again after each finishing operation as necessary to prevent drying shrinkage cracks.
 4. Do not work evaporation retardant into the surface of the concrete.
 5. Do not use evaporation retardant as finishing aid (to rehydrate surface a creamy state for finishing).
- C. Concrete sealer:
 1. Floors and slabs to receive concrete sealer: See Room Finish Schedule on the Drawings, and Section 03366 - Concrete Finishes.

3.07 CURING

- A. Cure concrete by methods specified in this Section.
- B. Keep concrete continuously moist and at an average daily temperature of at least 50 degrees Fahrenheit for a minimum of 7 days after placement.
 1. Provide at least 350 degree days of curing (350 degrees times 7 days of 24 hours each).
 2. If hourly temperatures at any surface of a concrete placement drop below 50 degrees Fahrenheit during the curing period, count the period below 50 degrees Fahrenheit as zero degrees, and extend the curing time to compensate.

- C. Schedule of curing methods:
1. Cure the following concrete surfaces using water curing, or plastic membrane curing.
 - a. Floor surfaces of water containment structures.
 - b. Surfaces where additional concrete will be placed over or against the surface, including concrete joints.
 - c. Surfaces where grout or other toppings will be placed over the surface.
 - d. Slabs scheduled to receive concrete sealer, or other bonded or adhered architectural finishes.
 - e. Formed surfaces scheduled to receive coatings, paint, adhered masonry, cementitious materials, or other similar finishes, and where formwork is removed within 7 days after concrete placement.
 - f. Horizontal concrete surfaces at tops of walls.
 2. Cure the following concrete surfaces by water curing, plastic membrane curing, or sprayed curing membrane. Selection of methods shall be at the Contractor's option.
 - a. Surfaces not listed in the preceding paragraph.
- D. Water curing:
1. Keep surfaces of concrete constantly and visibly wet, day and night, for period of not less than 7 days.
 - a. Each day forms remain in place will be counted as 1 day of water curing.
 - b. Do not loosen form ties during period when concrete is cured by leaving forms in place. No further curing credit will be allowed for forms remaining in place after contact has been broken between concrete surface and forms.
 2. Begin water curing as soon as concrete attains initial set.
 3. Maintain a wet surface by ponding, continuous sprinkling, covering with saturated burlap, or otherwise saturating the surface by means acceptable to Engineer.
 - a. Flood top of walls with water at least 3 times per day and keep surfaces moist at all times during the 7-day curing period.
 - b. Provide plastic sheet material over surfaces if required to maintain a wet surface during arid or windy conditions. See plastic membrane curing requirements for additional details.
 4. Use water having a temperature within 20 degrees Fahrenheit of the temperature of concrete, and not lower than the minimum temperature allowed for the concrete surface during curing.
- E. Plastic membrane curing:
1. Install plastic membrane as soon as concrete is finished and can support limited pedestrian traffic without damage.
 2. Cover entire surface of finished concrete with membrane.
 3. Anchor membrane to prevent uplift from wind or air trapped below the sheet.
 4. Fully seal joints and edges to provide full seal around perimeter.
 5. Keep concrete under plastic membrane moist, regularly monitoring surfaces and adding supplemental moisture if necessary. Add water as specified for water curing.

- F. Sprayed membrane curing compound:
1. Apply curing compound to concrete surface after repairing and patching, and within 1 hour after forms are removed.
 - a. If more than 1 hour elapses after removal of forms, do not use membrane curing compound. Instead, provide water curing for not less than 7 days.
 - b. Do not remove sprayed membrane curing compound from concrete in less than 7 days after initial application.
 - c. When application of curing compound at concrete joints is accepted by Engineer, take care to apply curing compound to all surfaces along full profile of joints.
 2. Apply curing compound by mechanical, power operated sprayer with mechanical agitator that will uniformly mix all pigment and compound.
 - a. Apply curing compound in at least 2 coats.
 - b. Apply each coat in direction turned 90 degrees from application direction of the preceding coat.
 - c. Apply curing compound in sufficient quantity so that concrete has uniform appearance and its natural color is effectively and completely concealed immediately after spraying.
 - d. Continue to coat and recoat surfaces until specified coverage is achieved and until coating film remains on concrete surfaces.
 3. Thickness and coverage of curing compound:
 - a. Provide curing compound having film thickness that can be scraped from surfaces at any and all points after drying for at least 24 hours.
 - b. Contractor is cautioned that method of applying curing compound specified in this Section may require more curing compound than normally suggested by manufacturer of curing compound and is more than is customary in the trade. Apply amounts specified in this Section, regardless of manufacturer's recommendations or customary practice.
 4. If Contractor desires to use a curing compound other than specified product, coat sample areas of concrete wall with proposed curing compound, and also coat similar adjacent area with the specified compound in the manner specified, for comparison:
 - a. If proposed sample is not equal or better, in opinion of the Engineer, the proposed substitution will not be allowed.
 5. Removal of curing compound.
 - a. After curing period is complete, remove curing compound placed on surfaces that will receive additional concrete, including all concrete joint surfaces, by heavy sandblasting or by other means acceptable to Engineer. Complete removal and cleanup prior to placing any new concrete against the surface.
 - b. Where additional finishes will be applied over concrete surfaces, unless otherwise recommended by the manufacturer of the finish to be applied, remove curing compound by sandblasting. Provide blasting as necessary to fully remove curing compound.
 6. Prior to final acceptance of the Work, remove, by sandblasting or by other method acceptable to the Engineer, any curing compound on surfaces exposed to process water or exposed to view, so that only natural color of finished concrete is visible and uniform over the entire surface.

3.08 PROTECTION

- A. General:
 - 1. Keep forms in place, as specified in Section 03102 - Concrete Formwork, to provide curing and to protect concrete surfaces and edges from damage.
 - 2. Immediately after forms are removed, carefully examine concrete surfaces, and repair any irregularities in surfaces and finishes as specified.
- B. Loading of concrete members:
 - 1. Placement of loads on or against green concrete is not permitted.
 - 2. Do not place soil against walls, or fill over the top of concrete until conditions designated in the following paragraphs are satisfied:
 - a. Walls have been cast to their full height in the structure and have achieved their minimum specified 28-day compressive strength.
 - b. Connecting slabs and beams that brace the walls are in place, are complete, and (in the case of concrete) have achieved their minimum specified 28-day compressive strength.

3.09 COLD WEATHER CONCRETING

- A. Implement cold weather concreting procedures during periods of cold weather as defined in this Section.
 - 1. Comply with the recommendations of ACI PRC-306 and this Section.
- B. Prepare a cold weather concreting plan. Maintain at least 1 copy of the plan on site. Provide plan for review if requested by the Engineer.
 - 1. Include procedures for batching, delivery, placement, curing, protection, and for monitoring and recording the temperature of the concrete and the surrounding environment.
 - 2. Describe procedure to be implemented in the event of abrupt changes in weather conditions or of equipment failure.
 - 3. Review cold weather concreting plan during pre-construction meeting. Make provisions to address any concerns expressed by Engineer before beginning concrete placements.
- C. Preparation:
 - 1. Do not place concrete over frozen subgrade materials. Provide insulating material and supplementary heat if required to maintain a thawed surface.
 - 2. Do not place concrete around metallic elements whose temperature is less than 40 degrees Fahrenheit. If heating is required, use processes that do not alter the metallurgical properties of the elements.
 - 3. Remove snow, ice, and frost from reinforcement, embedments and forms. Schedule such removal immediately before concrete placement so that surfaces do not refreeze.
- D. Batching, delivery, placement and finishing:
 - 1. Accelerating admixtures will not be permitted.
 - 2. Based on temperature of the environment and the surfaces where concrete will be placed, select and maintain mix temperature as recommended in ACI PRC-306.
 - a. Make provisions for temperature loss during delivery and placing.

- b. Place concrete at or slightly above the minimum recommended batch temperatures. Do not exceed these minimum values by more than 20 degrees Fahrenheit.
 - 3. Heating: If temperature of water or aggregates is below 35 degrees Fahrenheit, heat the materials.
 - a. Mixing water: Do not heat above 140 degrees Fahrenheit.
 - b. Aggregates:
 - 1) Heat uniformly to eliminate ice, snow, and frozen lumps of material.
 - 2) Avoid overheating.
 - 3) Do not exceed average temperature of 140 degrees Fahrenheit or spot temperature of 200 degrees Fahrenheit.
- E. Protection and curing:
 - 1. Protect concrete to provide continuous warm moist curing immediately after placement and during protection period.
 - 2. Minimum protection period: 7 days until concrete reaches specified minimum compressive strength.

3.10 HOT WEATHER CONCRETING

- A. Implement hot weather concrete procedures during periods of hot weather as defined in this Section.
 - 1. Comply with the recommendations of ACI PRC-305 and this Section.
- B. If placements during hot weather are expected, and when requested by the Engineer, prepare a hot weather concreting plan.
 - 1. Maintain at least 1 copy on site.
 - 2. Provide plan for review if requested by the Engineer.
 - a. Include procedures for batching, delivery, placement, curing, protection, and monitoring and recording the temperature of the concrete and the surrounding environment.
 - b. Describe procedures to be implemented in the event of abrupt changes in weather conditions, or in the event of equipment failure.
 - c. Review hot weather concreting plan during pre-construction meeting. Make provisions to address any concerns expressed by Engineer before beginning concrete placements.
- C. Preparation:
 - 1. Do not place concrete against forms, reinforcement, or embedments with a surface temperature greater than 120 degrees Fahrenheit.
 - a. If necessary, to maintain maximum concrete temperature during placing, cool forms and reinforcement to temperature below 90 degrees Fahrenheit using water or shades.
 - b. Do not allow water to puddle in forms or placement areas.
 - 2. Moisten forms or subgrade to maintain a saturated surface without standing water or soft spots.
 - 3. Provide windbreaks, shades, fog spray, sprinkling, wet cover, or other means required to protect concrete from premature loss of moisture and rapid temperature gain.

- D. Batching and delivery:
1. Retarding admixtures will not be permitted.
 2. Temperature of concrete delivered for placement shall not exceed 90 degrees Fahrenheit.
 - a. Maintain uniform temperature in the mix below this level during batching, delivery, placing, and consolidation.
 - b. Temperature of mix, even if below the maximum allowable temperature specified, shall be maintained at a level to avoid loss of slump, flash setting, or cold joints in placements.
 3. If necessary:
 - a. Mix water may be chilled or replaced with ice to maintain mix temperature. Where mix water is replaced with ice, provide replacement at a 1-to-1 ratio by weight.
 - b. Shade transit mixed concrete trucks, or cool mixing outside of container with water to control temperature of concrete.
- E. Placing and finishing:
1. Place and finish concrete promptly. Place so that vertical lift lines will not be visible in exposed concrete surfaces.
 2. Provide plastic sheeting, fog nozzles, shades or other means to reduce concrete temperature and protect from moisture loss.
- F. Protection and curing:
1. Furnish and locate maximum/minimum temperature recording thermometers in sufficient numbers to confirm concrete temperatures over full area and edges of concrete.
 2. Flatwork: Protect and cure using water curing methods as specified in this Section.
 - a. Water curing:
 - 1) Keep concrete continuously wet and make provisions for runoff.
 - 2) For sprinkling or soaker hoses, maintain temperature of water as close as possible to the temperature of the concrete to minimize effects of thermal shock.
 3. Formed surfaces: Protect and cure using forms left in place or membrane curing methods as specified in this Section.
 - a. Cover forms and keep continuously moist for at least 24 hours after placement.
 - b. Loosen forms as soon as this can be accomplished without damaging the concrete.
 - c. Maintain continuously moist surfaces by fogging or spraying with water, or by application of curing compound as specified.

3.11 FIELD QUALITY CONTROL BY CONTRACTOR

- A. Provide quality control over the Work of this Section as specified in Section 01450 - Quality Control.
- B. Field tests:
 - 1. During progress of construction, provide testing to determine whether the concrete, as being produced, complies with requirements specified.
 - 2. Sampling and testing shall be performed by Contractor's testing laboratory. See Section 01455 - Regulatory Quality Assurance - Special Tests and Inspections for requirements.
 - a. Cooperate in testing by allowing free access to the Work for testing laboratory to sample and test materials.
 - b. Provide full access for Engineer to observe concrete sampling and testing at any time.
 - c. Contractor is responsible for providing care of and curing conditions for test specimens in accordance with ASTM C31 until specimens are collected by testing laboratory.
 - d. Provide 4 firmly braced, insulated, heated, closed wooden curing boxes, each sized to hold 10 specimens. Include cold weather temperature and hot weather temperature control thermostat for initial curing and storage from time of fabrication through shipment to Owner's testing laboratory.
 - 3. Testing shall include:
 - a. Sampling of concrete in accordance with ASTM C172.
 - b. Temperature of concrete at delivery in accordance with the requirements of ASTM C1064 and as specified in this Section.
 - c. Slump of concrete using slump cone in accordance with requirements of ASTM C143. Test slump at the following intervals:
 - 1) At the beginning of each placement.
 - 2) As often as necessary to keep slump within the specified range, but not less than every 6th truck.
 - 3) When requested to do so by the Engineer.
 - 4) Observe concrete during slump test for signs of segregation.
 - a) Observe concrete to see if mortar or moisture flows from slumped concrete.
 - b) Reject concrete if mortar or moisture flows out of mix.
 - d. Unit weight of concrete in accordance with ASTM C138.
 - e. Air entrainment in accordance with ASTM C173. Test air content at the following intervals:
 - 1) At beginning of each placement.
 - 2) As often as necessary to keep entrained air within specified range, but not less than every 6th truck.
 - 3) When requested to do so by the Engineer.
 - 4) Test air entrainment in concrete in accordance with ASTM C173. If air entraining admixtures used for the Work require alternate testing procedures, advise the independent testing laboratory well in advance of the dates of testing, and confirm that appropriate equipment and personnel are provided for the test.
 - 5) Make air test at point of delivery (discharge from mixer). For pumped concrete, make air tests at point of delivery and at point where expelled after pumping for placement.

- f. Compressive strength in accordance with ASTM C39. Required number of cylinders is as follows:
 - 1) Not less than 6 cylinder specimens, 4 inches in diameter by 8 inches long, will be tested for each 150 cubic yards of each class of concrete, with minimum of 6 specimens for each class of concrete placed; not less than 6 specimens for each half day's placement; and not less than 2 sets of 6 specimens for each structure.
 - 2) 1 cylinder will be broken at 7 days, 1 at 14 days, and 3 at 28 days. 6th cylinder may be used to evaluate strength after 28 days if requested by the Engineer.
 - 3) Retain and store "6th cylinders" (tested and untested) at testing laboratory until 56 days. Break "6th cylinder" when directed by the Engineer.
- g. Provide full access for Engineer to observe concrete sampling and testing at any time.

3.12 FIELD QUALITY CONTROL BY OWNER

- A. Provide on-site inspection and field quality assurance for the Work of this Section as specified in Section 01450 - Quality Control.
- B. Special tests and inspections: See Section 01455 - Regulatory Quality Assurance.
- C. Field inspections:
 - 1. Required inspections:
 - a. Observe construction for conformance to the Contract Documents and the accepted submittals.
 - 2. Records of inspections:
 - a. Provide record of each inspection.
 - b. Submit copies to Contractor upon request.
- D. Field tests:
 - 1. Engineer may request, at any time, additional testing to confirm that materials being delivered and placed conform to the requirements of the Contract Documents.
 - a. If such additional testing shows that the material do not conform to the specified requirements, Contractor shall pay the cost of these tests.
 - b. If such additional testing shows that the materials do conform to the specified requirements, Owner will pay the cost of these tests.

3.13 NON-CONFORMING WORK

- A. Remove and replace or repair non-conforming and defective work.
 - 1. Provide repairs having strength equal to or greater than specified concrete for areas involved.
 - 2. Provide replacement or repair of non-conforming work by means acceptable to the Engineer and at no additional cost to Owner.
 - 3. Project schedule will not be extended based on work to address non-conforming concrete.

- B. Concrete not conforming to the specified requirements for properties of plastic concrete: Remove from the site and replace with conforming materials at no additional cost to Owner.
1. Temperature: Do not use concrete having a temperature above or below the limits specified in this Section.
 2. Slump: Do not place concrete that does not conform to requirements for slump.
 3. Air entrainment: Do not use concrete that does not conform to requirements for percentage of entrained air.
- C. Concrete not conforming to the specified requirements for compressive strength:
1. Concrete is expected to reach a compressive strength equal to or greater than the minimum specified compressive strength f'_c in Table 3 of this Section.
 2. Strength of concrete will be considered acceptable if following conditions are satisfied.
 - a. Averages of all sets of 3 consecutive strength test results is greater than or equal to the specified compressive strength f'_c .
 - b. No individual strength test (average of 3 cylinders) falls below the strength specified in Table 6 of this Section.
 - c. Where relationships between 7-day and 28-day compressive strength, or between 28-day and 56-day compressive strength, have been provided as part of the mix design submittals:
 - 1) 7-day strength may be considered as an indication of 28-day strength provided effects of temperature and humidity between 7 days and 28 days are taken into account.
 - 2) 28-day strength may be considered as indication of 56-day strength provided effects of temperature and humidity between 28 days and 56 days are taken into account.

Table 6: Strength Compliance Requirements	
Minimum Specified Compressive Strength, f'_c (pounds per square inch)	Lower Bound of an Individual Compressive Strength Test (pounds per square inch)
Less than 5,000	$f'_c - 500$
Over 5,000	$f'_c - (0.10 \times f'_c)$

3. Non-compliant strength tests.
 - a. Mark non-compliant strength test reports to highlight the non-complying results, and immediately forward copies to all parties on the test report distribution list.
 - b. Initial treatment may consist of additional curing of affected portion(s) followed by not less than 3 cores at each affected area, taken in accordance with ASTM C42 and ACI CODE-318. Obtain Engineer's acceptance of proposed coring locations before proceeding with that work.
 - c. Submit report of compressive strength testing for Engineer's review.
 - d. If requested by the Engineer, provide additional cores, and obtain petrographic testing in accordance with ASTM C856. Submit results for Engineer's review.
 - e. If additional curing does not bring the average strength of 3 cores taken in affected area to at least specified compressive strength f'_c , designate such concrete in affected area will be considered defective.

- f. Engineer may require the Contractor to strengthen defective concrete by means of additional concrete, additional reinforcing steel, or replacement of defective concrete, all at the Contractor's expense.
- D. Concrete sections or surfaces with honeycombing and voids:
- 1. Provide repairs having surface appearance and finish consistent with that of the surrounding work and acceptable to the Engineer.
 - 2. Do not patch, repair, or cover defective Work without prior inspection by the Engineer.
 - 3. Preparation of concrete for repair:
 - a. Make no repair until Engineer has accepted methods for preparing surfaces and for making and curing repairs.
 - b. Chip out and key-in imperfections in the Work to make them ready for repair.
 - c. Coat bonding surfaces and edges of repair area with one of the following bonding agents as accepted by the Engineer.
 - 1) Epoxy bonding agent as specified in Section 03071 - Epoxies; or
 - 4. Methods of repair:
 - a. Dry pack mortar method:
 - 1) Use for holes having depth nearly equal to or greater than least surface dimension of hole, for cone-bolt holes, and for narrow slots cut for repair.
 - 2) Smooth holes: Clean and roughen by heavy sandblasting before repair.
 - 3) Install dry-pack mortar as specified in Section 03600 - Grouting.
 - b. Cement mortar method:
 - 1) Use for holes too wide to dry pack and too shallow for concrete replacement; and for comparatively shallow depressions, large or small, that extend no deeper than nearest surface reinforcement.
 - 2) Install cement mortar as specified in Section 03600 - Grouting.
 - c. Concrete replacement:
 - 1) Use when holes extend entirely through the concrete section or when holes are more than 1 square foot in area and extend halfway or more through the section.
 - 2) Form, place, consolidate, and cure concrete of same mix as the surrounding work.
- E. Leaking construction joints and cracks in concrete walls and slabs:
- 1. Repair cracks that develop in walls or slabs, and repair cracks that show any signs of leakage until all leakage is stopped.
 - 2. Pressure inject visible cracks in the following areas, other than hairline cracks and crazing, with repair products and methods acceptable to the Engineer.
 - a. Floors and walls of water bearing structures.
 - b. Walls and overhead slabs of passageways and occupied spaces where the opposite face of the member is exposed to weather or may be washed down and where the opposite face does not receive a separate waterproofing membrane.
 - c. Other items not specified to receive separate waterproofing membrane including slabs over water channels, wet wells, reservoirs, and other similar surfaces.

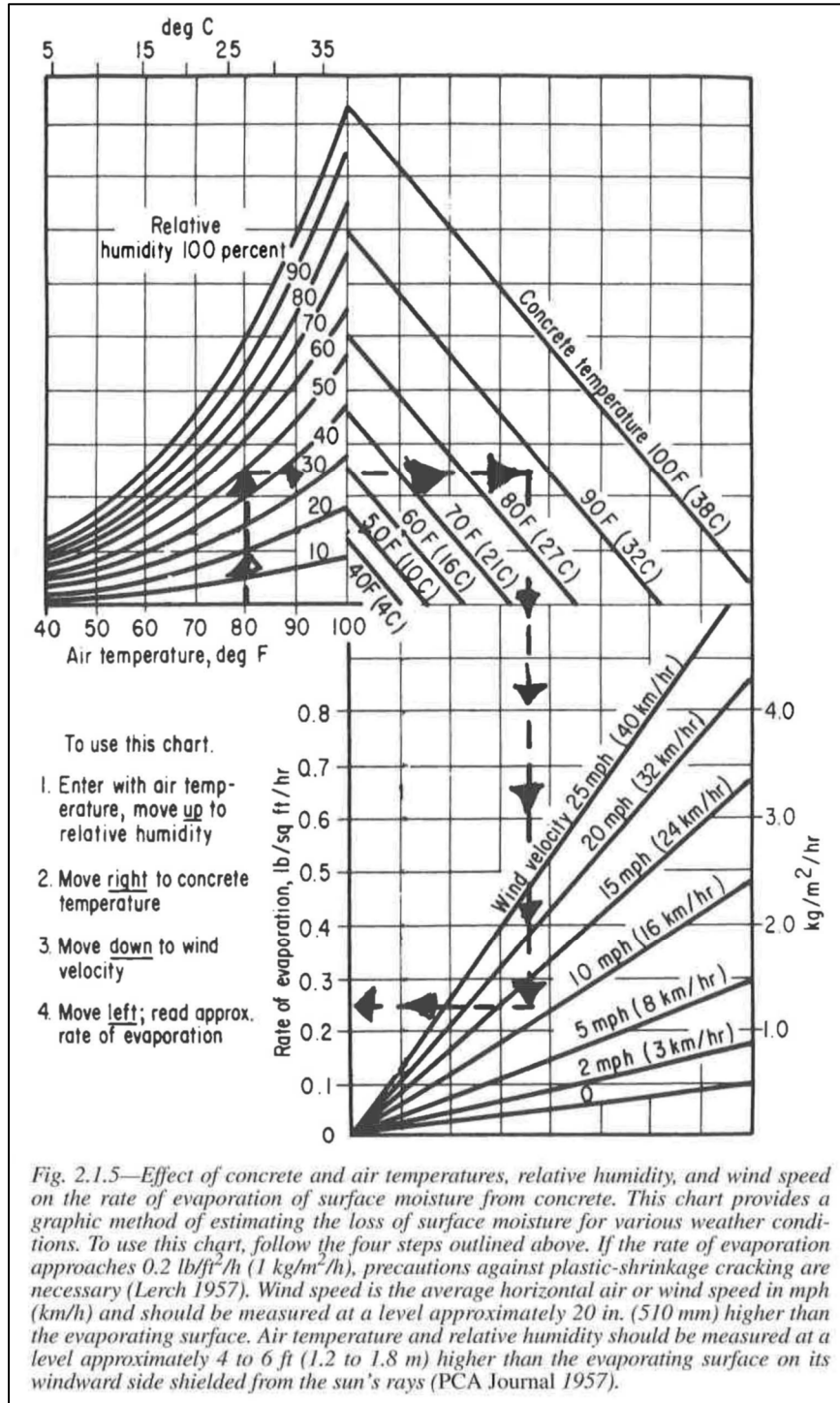
3. Continue pressure injection of cracks as specified until structure is watertight and remains watertight for not less than 1 year after date of Substantial Completion or date of final repair, whichever occurs later in time.
- F. Leaking expansion joints in concrete walls or slabs that include waterstops:
1. Repair any signs of leakage until all leakage is stopped.
 2. Pressure inject visible leaks with hydrophilic polyurethane foam resin as specified in Section 03933 - Hydrophilic and Hydrophobic Foam Polyurethane Resin Injection System.
 3. Continue pressure injection along joints lines as specified until structure is watertight and remains watertight for not less than 1 year after date of Substantial Completion or date of final repair, whichever occurs later in time.
- G. Walls and slabs at overhead channels that leak or sweat because of porosity or cracks too small for successful pressure injection with epoxy.
1. Seal on water or weather side by coating using surface-applied sealing system as specified in this Section.
 2. Apply as recommended by manufacturer published instructions. Where concrete continues to sweat or leak, apply additional coats of surface-applied sealing system until the sweating or leaks stop.
 3. Continue application of surface-applied sealing system until structure is watertight and remains watertight for not less than 1 year after date of Substantial Completion, or date of final repair, whichever occurs later in time.

END OF SECTION

ATTACHMENT A - MENZEL FORMULA AND NOMOGRAPH

MENZEL FORMULA AND NOMOGRAPH

Source: ACI PRC-350



ATTACHMENT B - COARSENESS FACTOR CHART

COARSENESS FACTOR CHART

Source: ACI PRC-302.1-15, Figure 8.9.2.2.

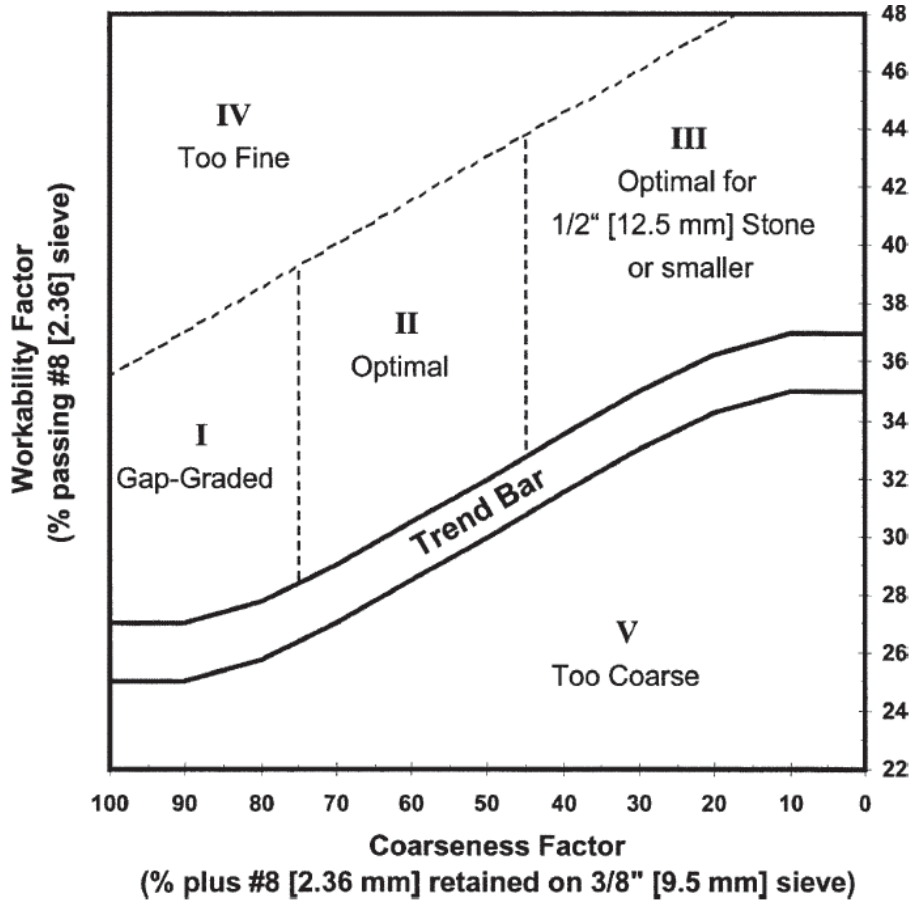
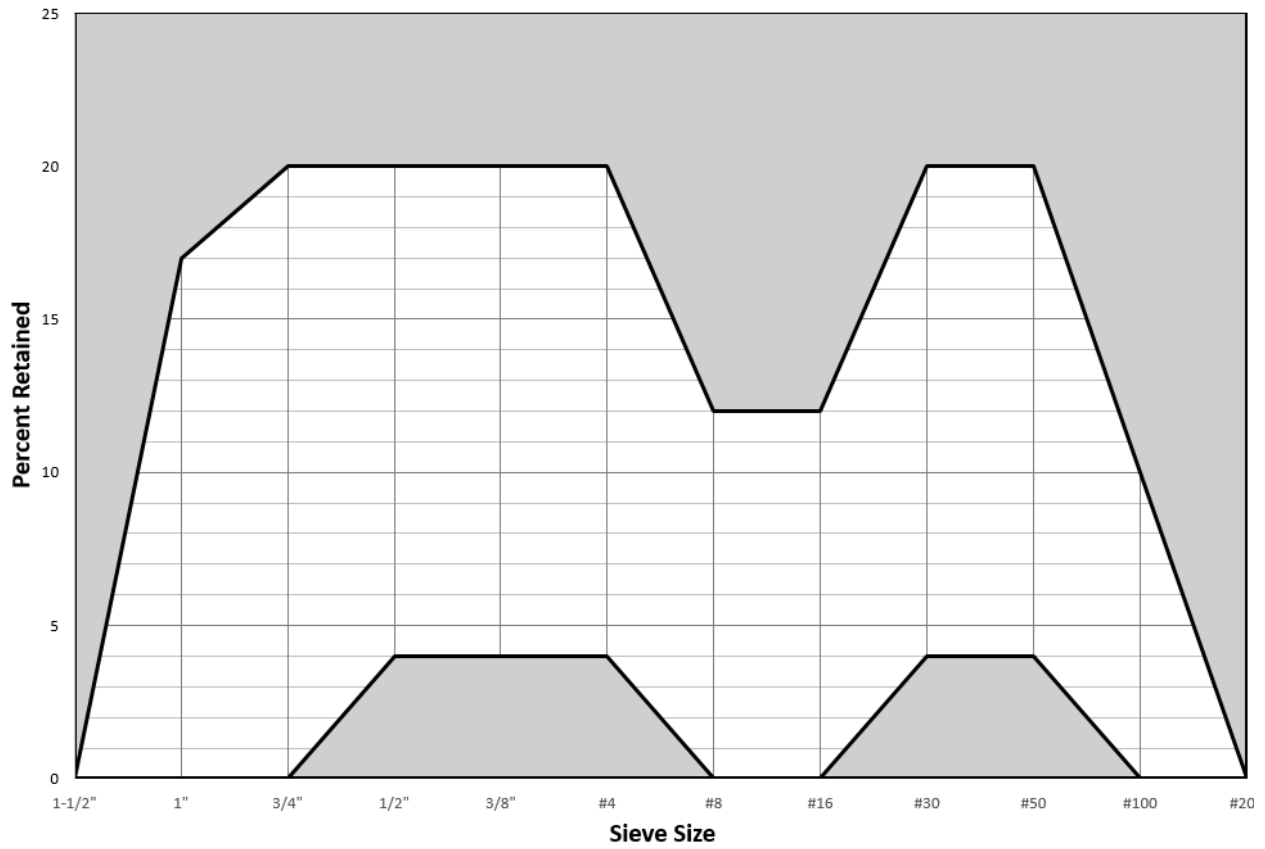


Fig. 8.9.2.2—Coarseness factor chart for evaluating potential performance of mixture.

ATTACHMENT C - COMBINED AGGREGATE GRADATION CHART

COMBINED AGGREGATE GRADATION CHART



ATTACHMENT D - CONCRETE PLACEMENT CHECKLIST

CONCRETE PLACEMENT CHECKLIST

Project: _____ Class of Concrete: _____
 Project No.: _____ Test Cylinders Taken? Yes: _____ No: _____

Preparation Slab	Contractor	N/A
Compaction Subgrade		
Filter Fabric/Drain Rock-ABC/Separator Fabric		
Drain Rock, Pea Gravel & Void Form		
Starter Wall Forms		
Reinforcing Steel		
Screeds		

Embedded Items	Contractor	N/A
A. Anchor Bolts		
B. Water Stop		
C. Rebar		
D. Electrical		
E. Plumbing Rough-in		
F. Mechanical		
G. HVAC		

Concrete Placement Equip.	Contractor	N/A
A. Crane		
B. Buckets		
C. Hoppers		
D. Vibrators		
E. Elephant trunks		
F. Floodlights		
G. Pump Truck		

Building Department Notification	
Date: _____	Time: _____

Prep Wall Concrete	Contractor	N/A
Access To Work		
Ladders Secured		
Clean up and Washed Out		
Reinforcing Steel		

Forms	Contractor	N/A
A. Alignment & Grade		
B. Scaffolding		
C. Sleeves & Wall Castings		
D. Embedded Items		
E. Electrical		
F. Plumbing Rough-in		
G. Piping		

Record of Curing Conditions During Placement	
Start: _____	Finish: _____
Date: _____	
Time: _____	
Weather: _____	
Temperature: _____	
Comments: _____	

Location of Placement _____

The Contractor certifies the above-proposed concrete placement is prepared as indicated and is in accord with the Contract Drawings and Specifications. The Contractor requests permission to begin placement of concrete on the date of _____ at _____. The estimated number of yards is _____. The estimated duration of the placement is _____.

By: _____
Contractor

Released for placement by: _____
Engineer

SECTION 03366
CONCRETE FINISHES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
1. Concrete finishes.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
1. 117-10 - Specification for Tolerances for Concrete Construction and Materials and Commentary.
- B. International Concrete Repair institute (ICRI):
1. Guideline No. 301.2: Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

1.03 TERMINOLOGY

- A. The words and terms listed below are not defined terms that require initial capital letters, but, when used in this Section, have the indicated meaning.
1. Grade line: A reference line that separates surfaces considered to be above grade from those considered to be below grade. Located 12 inches below finished grades at the perimeter of the structure.
 2. Water line: A reference line that separates surfaces considered to be above the water level (and visible in the finished work) from those considered to be below the water level (and not visible in the finished work). For each water-bearing cell of a structure, defined as a line located 2 feet below the normal operating water level in that cell.

1.04 QUALITY ASSURANCE

- A. Qualifications:
1. Finishing personnel:
 - a. Use qualified flatwork finishers.
 - b. Finishing supervisor must have at least 5 years of experience finishing concrete.
- B. Mockups:
1. Construct mockup panels showing finishing of formed surfaces for review by the Engineer.
 - a. Construct mockup panels demonstrating concrete finishes for vertical surfaces:
 - 1) Construct mockup panels for F4 and F5 finishes and tie-hole repairs for review by the Engineer.

2. Construct mockup slabs showing finishing of unformed surfaces for review by the Engineer.
 - a. Construct mockup slabs demonstrating concrete finishes for horizontal surfaces:
 - 1) Construct mockup slabs for S1, S2, S4, and S5 finishes.
3. Include the following elements in mockup panels and slabs.
 - a. Concrete joints:
 - 1) Horizontal and vertical joints of the types included in the Work.
 - b. Concrete repairs:
 - 1) Repairs using materials and procedures proposed for the Work.
4. Construct mockup panels and slabs at beginning of project for review by the Engineer.
5. Panels and portions thereof accepted by the Engineer will serve as the standard of quality and workmanship for the Work.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packing and shipping:
 1. Deliver and store packaged materials in original containers until ready for use.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials for mortar:
 1. As specified in Section 03300 - Cast-in-Place Concrete, unless otherwise noted.
 2. Where finished surfaces will be visible in the finished work, use same cement used for concrete batches in that area. Add white cement if required to obtain color match between base concrete and finishing mortars.

2.02 MIXES

- A. Cement mortar:
 1. As specified in Section 03600 - Grouting.
- B. Dry-pack mortar:
 1. As specified in Section 03600 - Grouting.
- C. Mortar mix for F4 finish ("F4 Mortar"):
 1. Consisting of 1 part cement and 1-1/2 parts of fine sand passing Number 100 screen. Mix with enough water and emulsified bonding agent to have consistency of thick cream.
- D. Mortar mix for F5 finish ("F5 Mortar"):
 1. Consisting of 1 part cement to 1-1/2 parts of sand passing Number 16 screen.

2.03 EVAPORATION RETARDANT

- A. As specified in Section 03300 - Cast-in-Place Concrete.

2.04 NON-SLIP ABRASIVE

- A. Type: Aluminum oxide abrasive of size 8/16, having structure of hard aggregate. Homogeneous, non-glazing, rust-proof, and unaffected by freezing, moisture, and cleaning compounds.
- B. Manufacturers: One of the following, or equal:
 - 1. Abrasive Materials Incorporated, Hillsdale MI.
 - 2. Exolon Company, Tonawanda NY.

2.05 CONCRETE SEALERS

- A. Floor sealer and dust-proofer:
 - 1. Non-membrane forming, breathable, non-yellowing, penetrating sealer designed to densify and seal a cured concrete surface.
 - 2. Low odor, VOC content of 0 grams per liter, and stable when exposed to ultraviolet radiation from sunlight.
 - 3. Manufacturers: One of the following, or equal:
 - a. Dayton Superior: Day-Chem Sure Hard Densifier (J-17).
 - b. Euclid Chemical Company: Euco Diamond Hard.
 - c. L&M Construction Chemicals: Seal Hard.
 - d. W.R. Meadows: Liqui-Hard.

PART 3 EXECUTION

3.01 CONCRETE FINISHING - FORMED SURFACES

- A. Scope:
 - 1. Finish formed surfaces with one of the finishes specified in the following paragraphs and as indicated in the Schedule of Concrete Finishes in this Section.
 - 2. Formed surfaces are those surfaces that the plastic concrete is placed against a temporary containment surface that will be removed after the concrete sets and takes its final form.
- B. General:
 - 1. Provide setting and curing time from casting of concrete to removal of forms as specified in Section 03300 - Cast-in-Place Concrete.
 - 2. Provide curing after removal of forms as specified in Section 03300 - Cast-in-Place Concrete.
 - 3. Materials and mixes for finishes.
 - a. Cement: Add white cement to mortars and grouts used for finishing if required to match color of repairs to surrounding surfaces.
 - 4. Grinding:
 - a. Where grinding of concrete surfaces is permitted:
 - 1) Perform grinding using an iron-free wheel, such as an aluminum oxide wheel, to avoid entrapment of particles that produce rust stains.
 - 2) At locations where plastic-protected reinforcing bar supports are used, limit grinding to a maximum depth of 1/16 inch.

- C. F1 finish: "Rough Form Finish":
1. Repair defective work.
 2. Remove fins and other projections larger than 1/2 inch.
 3. Fill tie holes using dry-pack mortar.
 4. After removal of any curing compounds, fill depressions larger than 1 -inch wide or 1/2-inch deep using dry-pack mortar.
 5. Leave surface with texture imparted by forms.
 6. Surface irregularity: Not exceeding a 1-inch gap when measured over the length of a 5-foot straightedge.
- D. F2 finish: "Form Finish":
1. Repair defective work.
 2. Remove fins and other projections larger than 1/4 inch.
 3. Fill tie holes using dry-pack mortar.
 4. Fill depressions.
 - a. Fill after removal of any curing compounds.
 - b. Fill depressions larger than 1/2 inch in width or 1/2 inch in depth using cement mortar.
 - c. Fill larger voids and depressions, use dry-pack mortar.
 5. Leave surfaces with texture imparted by forms.
 6. Surface irregularity: Not exceeding a 1/4-inch gap when measured over the length of a 5-foot straightedge.
- E. F3 finish: "Smooth Form Finish":
1. Repair defective work.
 2. Repair rough or irregular surface finishes resulting from failure of form release agent or other form conditions and provide a smooth, uniform surface appearance.
 3. Remove fins: Grind offsets, projections, and rough spots larger than 1/8 inch smooth.
 4. Fill tie holes using dry pack mortar.
 5. Fill depressions:
 - a. Fill after removal of any curing compounds.
 - b. Fill depressions 1/4 inch and larger in depth or 3/4 inch in width using cement mortar.
 - c. For larger depressions, fill using dry pack mortar.
 6. Top coat tie holes and filled depressions with cement mortar to provide uniform appearance.
 7. Leave surfaces with texture that is generally smooth and uniform in appearance.
 8. Surface irregularity: Not exceeding a 1/8 inch gap when measured over the length of a 5-foot straightedge.
- F. F4 finish: "Rubbed Finish":
1. As specified for F3 finish, except prepare surfaces and fill depressions 1/16 inch or larger in depth or width as follows.
 2. Fill depressions.
 - a. "Brush-off" sandblast surfaces to expose all depressions and voids near the surface of the concrete.
 - b. Thoroughly wet surfaces and begin filling depressions while surfaces are still damp.

- c. Use clean burlap, sponge rubber floats, or trowels to rub plastic F4 mortar over the entire surface to be finished. Fill pits, holes, and depressions.
 - d. Wipe surfaces clean. Do not leave any mortar on the surface, except that within the depressions.
 - e. Cure: Moist cure surfaces.
- G. F5 finish: "Stoned Finish":
- 1. As specified for F3 finish, except add stoned finish as follows:
 - 2. Fill depressions:
 - a. Wet surfaces thoroughly with brush.
 - b. Rub wetted surfaces with a hard wood float dipped in water containing 2 pounds of Portland cement per gallon of water.
 - c. Rub surfaces until form marks and projections are removed.
 - d. Using a brush, spread plastic grindings from the rubbing operation uniformly over the surface. Work the material in to fill pits and small voids.
 - e. Cure: Moist cure brushed surfaces for at least 72 hours.
 - 3. Finish surfaces:
 - a. After curing, obtain final finish by rubbing with a No. 50 grit carborundum stone.
 - b. Continue rubbing until entire surface has a smooth texture and is uniform in color.
 - c. Cure: Continue curing for remainder of specified time.
 - 4. Note: If surfaces have become too hard to finish as specified in the preceding paragraphs, the following alternative procedure may be used:
 - a. Sandblast and wash related surfaces exposed to view, whether finished or not.
 - b. While surfaces are still damp, rub surface with mortar mix for F5 finish.
 - c. Finish by rubbing mortared surface with No. 60 grit carborundum stone. Add F5 mortar until surface is evenly filled without excess mortar. Continue stoning until surface is hard.
 - d. Moist cure surface for 72 hours.
 - e. After curing, make surface smooth in texture and uniform in color by rubbing with a No. 50 or No. 60 grit carborundum stone.
 - f. Continue curing until 7-day curing period is complete.

3.02 CONCRETE FINISHING - UNFORMED SURFACES

- A. Scope:
- 1. Finish unformed surfaces with one of the finishes specified in the following paragraphs and as indicated in the Schedule of Concrete Finishes in this Section.
 - 2. Unformed surfaces are those surfaces that are not cast against a temporary containment and the specified finish is achieved by tooling.
- B. General:
- 1. Concrete placement:
 - a. Place concrete at a rate that allows spreading, straight-edging, and initial floating before bleed water appears.
 - 1) Consider characteristics of concrete mixes used, including potential for accelerating or retarding effects of admixtures, fly ash, and temperatures, on plans for and scheduling of placement and finishing.

- b. Place, consolidate, strike-off, and screed concrete level to bring surfaces to required planes and lines. Eliminate high and low spots.
 - c. Strike tops of walls and similar surfaces smooth and finish as specified to a texture consistent with that of adjacent formed surfaces.
 - d. After screeding, apply evaporation retardant to concrete surface if weather conditions will result in rapid evaporation of moisture from the surface of the concrete. Do not work evaporation retardant into the surface of the concrete.
2. Floating and re-straightening:
- a. Float concrete to compact and consolidate the surface.
 - b. Initial floating:
 - 1) Provide initial floating immediately after screeding.
 - 2) Perform by hand using a wide bull float, darby, or highway straightedge.
 - 3) Complete before excess moisture or bleed water is present on the surface.
 - c. Wait for concrete to stiffen and for the bleed water to stop rising and dissipate before proceeding with edging, hand-tooled jointing, and second floating.
 - d. After initial floating, apply evaporation retardant to concrete surface if weather conditions will result in rapid evaporation of moisture from the surface of the concrete. Do not work evaporation retardant into the surface of the concrete.
 - e. Second floating:
 - 1) Do not commence until bleed water has dissipated and concrete has stiffened enough to support weight of finishers and finishing equipment.
 - 2) May be by hand, or, if accepted by the Engineer, may be done using a bladed power float equipped with float shoes, or a power disk float.
 - 3) Float surfaces to a true, even plane, with no coarse aggregate visible.
 - 4) Evaporation retardant may not be applied after second floating.
 - f. Flatness:
 - 1) Specified tolerances for flatness may require re-straightening of the surface between first and second floating operations and before steel troweling. Re-straighten concrete as required.
 - 2) Modify power equipment with alternate float shoes or other equipment if required to achieve specified flatness.
3. Troweling: Where finishes require troweling, conform to the following requirements:
- a. After surface moisture from floating has disappeared, steel trowel to a smooth, hard, dense concrete surface.
 - b. Provide at least 2 trowelings.
 - 1) Avoid excessive troweling.
 - 2) Use smaller trowels for successive troweling.
 - 3) Make each successive troweling perpendicular to the previous pass.
 - c. Do not add dry cement or additional water to the surface during troweling.
 - d. In lieu of hand steel troweling, a power machine for finishing concrete may be used if accepted by the Engineer.
 - 1) Do not use power machine if concrete has not attained the set necessary to permit finishing without introduction of high and low spots into the concrete surface.

- 2) Use equipment in full compliance with the manufacturer's recommendations.
 - 3) Use smaller blades or higher pressure for each successive troweling.
 - 4) Hand trowel areas of the concrete not accessible to power equipment.
 - 5) Tolerances for flatness specified may require re-straightening of the surface during finishing. Modify power equipment with alternate shoes or other equipment if required to achieve these requirements.
- e. Finishing with a fresno trowel or finishing to a "fresno finish" is not allowed.
4. Finishing tolerances:
 - a. Slabs sloped to drain: Finish surfaces to adequately drain toward designated points or lines, regardless of tolerances specified.
- C. S1 finish: "Scratch Finish":
1. Place, consolidate, and screed concrete level.
 2. Provide initial floating of concrete.
 3. Provide surface conforming to the "Conventional" floor flatness tolerance requirements of ACI 117 using the manual straightedge method (maximum 1/2-inch gap in 10 feet at 90 percent of locations; maximum 3/4-inch gap at any location), unless otherwise indicated.
 4. Before final set, roughen the surface with rakes.
 - a. For sloped surfaces, rake grooves in the direction of drainage.
 - b. Provide roughness equivalent to CSP 6 surface as designated by ICRI Guideline 310.2.
 5. Pressure wash surface to remove laitance before placing grout or toppings.
- D. S2 finish: "Floated Finish":
1. Place, consolidate, and screed concrete to required elevations and slopes.
 2. Provide initial and second floatings of concrete. Float to a uniform texture.
 3. Provide surface conforming to the "Flat" floor flatness tolerance requirements of ACI 117 using the manual straightedge method (maximum 1/4-inch gap in 10 feet at 90 percent of locations; maximum 3/8-inch gap at any location), unless otherwise indicated.
 4. Remove laitance and leave surface clean.
- E. S3 finish: "Steel Trowel Finish":
1. Place, consolidate, and screed concrete to required elevations and slopes.
 2. Provide S2 Floated Finish.
 3. Provide 2 trowelings:
 4. Provide finish conforming to the "Flat" floor flatness tolerance requirements of ACI 117 (maximum 1/4-inch gap in 10 feet), unless otherwise indicated.
- F. S4 finish: "Steel Trowel Finish - Free of Trowel Marks":
1. Finish as specified for S3 Steel Trowel Finish, except that final troweling shall remove all trowel marks from the slab surface.
- G. S5 finish: "Broomed Finish":
1. Finish as specified for S2 Floated Finish, except modify as follows:
 2. Finish surface by drawing a fine-hair broom lightly across the freshly floated surface.
 - a. Provide resulting roughness for a non-skid surface. Finishing and roughness is subject to review and acceptance by the Engineer.

- b. Direction of brooming:
 - 1) General:
 - a) In same direction of and parallel to expansion joints.
 - b) Perpendicular to primary direction of traffic.
 - 2) For sloped slabs, parallel to the direction of drainage.
 - 3) For round roof slabs, in the radial direction.

- H. S6 finish: "Non-Slip Abrasive Finish":
 - 1. Place, consolidate, and screed concrete to required elevations and slopes.
 - 2. Provide initial floating of surface.
 - 3. Prepare and apply abrasive as recommended by the manufacturer.
 - a. Apply using a shake screen or other accepted method to ensure even coverage without segregation of the abrasive.
 - b. Install abrasive at a rate of 25 pounds for each 100 square feet of surface area.
 - 4. After concrete has hardened enough to support the weight of a person, and unless otherwise indicated by the abrasive manufacturer, apply approximately 2/3 of the abrasive material required for coverage.
 - 5. Finish as specified for S2 Floated Finish, except that re-floating is not required.
 - 6. Apply remaining abrasive material at right angles to the first application and in locations necessary to provide the minimum specified thickness.
 - 7. Immediately after the second application, re-float the surface to embed abrasive.
 - 8. Finish as specified for S2 Steel Trowel Finish. Trowel abrasive into the surface, properly exposing material to produce a non-slip finish.

3.03 FIELD QUALITY CONTROL

- A. Provide field quality control for the Work of this Section as specified in Section 01450 - Quality Control.

- B. Field quality control by Contractor:
 - 1. Field inspections and testing:
 - a. Submit records of inspections and testing to Engineer within 24 hours after completion.
 - 2. Manufacturer's services.
 - a. Non-slip abrasive finish. Before beginning installation, conduct pre-installation meeting with manufacturer's technical representative to review product use and installation requirements.

- C. Field quality control by Owner:
 - 1. Special inspections, special tests, and structural observation:
 - a. Not required.
 - 2. Field inspections:
 - a. Observe construction for conformance to the Contract Documents and the accepted Submittals.
 - b. Provide record of each inspection. Submit copies to Engineer upon request.

3.04 NON-CONFORMING WORK

- A. Unsatisfactory finishes that have hardened will require removal, grinding, topping, or other correction acceptable to the Engineer.
- B. Re-work or refinish unsatisfactory finishes at no additional cost to the Owner.
- C. See Section 03300 - Cast-In-Place Concrete for requirements.

3.05 SCHEDULE OF CONCRETE FINISHES

- A. Formed surfaces: See Table 03366-A.
- B. Unformed surfaces: See Table 03366-B.

Table 03366-A: Concrete Finishes - Formed Surfaces

	Elements	Location	Surface Exposure	Finish	Notes
EXTERIOR SURFACES	Walls Columns Slab edges	Wet structure:	Above grade or water line:		
			- Exposed to view	F4	
			- Covered	F2	1a
			Below grade or water line:		
			- No coating	F1	
			- Bituminous coating	F2	
			- Waterproofing	F3	
		Dry structure:	Above grade line:		
			- Exposed to view	F4	
			- Covered	F2	1a
			Below grade line:		
			- No coating	F1	
- Bituminous coating	F2				
- Waterproofing	F3				
INTERIOR SURFACES	Walls Columns Slab edges	Wet structure:	Open basin:		
			- Above water line	F4	
			- Below water line	F3	
			Covered basin		
			- Above water line	F3	
		- Below water line	F3		
		Dry structure:	Exposed to view	F4	
	Covered		F2	1b	
	Overhead slabs and beams	Wet structure:	Open basin	F3	1c, 1d
			Covered basin	F2	1d
Dry structure:		Exposed	F3	1c, 1d	
		Covered by ceiling	F1	1d	

Notes:

- (1a) Coverings include additional surfaces applied over the concrete, such as veneer, stucco, plaster, etc.
- (1b) Coverings include additional surfaces applied over the concrete, such as veneer, stucco, plaster, furring strips with drywall, etc.
- (1c) Applies to overhead surfaces visible from normal pedestrian travel routes.
- (1d) At overhead slabs and beams, patch tie holes on sides of members.

Table 03366-B: Concrete Finishes - Unformed Surfaces					
	Element	Location	Exposure	Finish	Notes
EXTERIOR SURFACES	Footings	Extensions	Exposed	S3	
			Covered by soil	S2	
	Slabs and beams - exposed	Walking or possible walking paths	Tops of treatment structures	S5	2a, 2b, 2g
			Stairs & landings	S5	
		Roofs	Exposed	S5	
			Covered by roofing	S2	
	Slabs and beams - submerged	Unless otherwise noted	All	S3	2g
	Walls, Corbels	Top of wall or corbel	All	S3	One troweling
	Sidewalks	All		S5	
	Equipment Slabs	All		S5	
INTERIOR SURFACES	Floor slabs, includes flat and sloping surfaces	Wet structure	Exposed		
			- Basins & channels	S3	
			Covered		
			- To receive basin bottom grout	S1	2e
			- To receive concrete fill	S1	2f
		Dry structure	Exposed		
			- Pipe galleries	S4	2c
			- Stairs & landings	S4	2d
			- Shops & garages	S4	
			- Equipment rooms	S4	
			Covered		
			- Tile on mortar bed	S2	
			- Resilient flooring	S3	
- Carpet	S3				
Notes:					
(2a) Includes slabs covering tanks, basins, channels and similar structures.					
(2b) Includes tops of walls or beams that serve as walkways.					
(2c) In galleries with slabs subject to wetting, provide broom finish (S5) where indicated on the Drawings.					
(2e) Finish for basin bottom grout: See Section 03565 - Basin Bottom Grout.					
(2f) Finish for concrete fill: See Floor slab, wet structure, exposed basins and channels.					
(2g) Slabs include flat and sloping surfaces.					

C. Finish concrete surfaces in accordance with specifications.

END OF SECTION

SECTION 03600

GROUTING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Cement grout.
 - 2. Cement mortar.
 - 3. Dry-pack mortar.
 - 4. Epoxy grout.
 - 5. Grout.
 - 6. Non-shrink epoxy grout.
 - 7. Non-shrink grout.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2-inch cube specimens).
 - 2. C230 - Standard Specification for Flow Table for Use in Tests of Hydraulic Cement.
 - 3. C531 - Standard Test Method for Liner Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 4. C579 - Standard Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing and Polymer Concretes.
 - 5. C939 - Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
 - 6. C942 - Standard Test Method for Compressive Strength of Grouts for Preplaced-Aggregate Concrete in the Laboratory.
 - 7. C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).
 - 8. C1181 - Standard Test Methods for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts.
- B. International Concrete Repair Institute (ICRI):
 - 1. 310.2R - Selecting and specifying Concrete Surface Preparations for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.03 SUBMITTALS

- A. Cement grout:
 - 1. Mix design.
 - 2. Material Submittals.

- B. Cement mortar:
 - 1. Mix design.
 - 2. Material Submittals.
- C. Non-shrink epoxy grout:
 - 1. Manufacturer's literature.
- D. Non-shrink grout:
 - 1. Manufacturer's literature.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to jobsite in their original, unopened packages or containers, clearly labeled with manufacturer's product identification and printed instructions.
- B. Store materials in cool dry place and in accordance with manufacturer's recommendations.
- C. Handle materials in accordance with the manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

- A. Non-shrink epoxy grout:
 - 1. Manufacturers: One of the following, or equal:
 - a. Five Star Products, Inc., Five Star DP Epoxy Grout.
 - b. L&M Construction Chemicals, Inc., EPOGROUT.
 - c. Master Builder Solutions/Sika, MasterFlow 648.
 - 2. Non-shrink epoxy grout shall be 100 percent solid, premeasured, prepackaged system containing 2-component thermosetting epoxy resin and inert aggregate.
 - 3. Maintain flowable consistency for at least 45 minutes at 70 degrees Fahrenheit.
 - 4. Shrinkage or expansion: Less than 0.0006 inches per inch when tested in accordance with ASTM C531.
 - 5. Minimum compressive strength: 10,000 pounds per square inch at 24 hours and 14,000 pounds per square inch at 7 days when tested in accordance with ASTM C579, Method B.
 - 6. Compressive creep: Not exceed 0.0037 inches/per inch when tested under 400 pounds per square inch constant load at 140 degrees Fahrenheit in accordance with ASTM C1181.
 - 7. Coefficient of thermal expansion: Not exceed 0.000018 inches per inch per degree Fahrenheit when tested in accordance with ASTM C531, Method B.
- B. Non-shrink grout:
 - 1. Manufacturers: One of the following, or equal:
 - a. Five Star Products, Inc., Five Star Grout.
 - b. L&M Construction Chemicals, Inc., CRYSTEX.
 - c. Master Builder Solutions/Sika, MasterFlow 928.
 - 2. In accordance with ASTM C1107.
 - 3. Preportioned and prepackaged cement-based mixture.

4. Contain no metallic particles such as aluminum powder and no metallic aggregate such as iron filings.
5. Require only addition of potable water.
6. Water for pre-soaking, mixing, and curing: Potable water.
7. Free from emergence of mixing water from within or presence of water on its surface.
8. Remain at minimum flowable consistency for at least 45 minutes after mixing at 45 degrees Fahrenheit to 90 degrees Fahrenheit when tested in accordance with ASTM C230.
 - a. If at fluid consistency, verify consistency in accordance with ASTM C939.
9. Dimensional stability (height change):
 - a. In accordance with ASTM C1107, volume-adjusting Grade B or C at 45 degrees Fahrenheit to 90 degrees Fahrenheit.
 - b. Have 90 percent or greater bearing area under bases.
10. Have minimum compressive strengths at 45 degrees Fahrenheit to 90 degrees Fahrenheit in accordance with ASTM C1107 for various periods from time of placement, including 5,000 pounds per square inch at 28 days when tested in accordance with ASTM C109 as modified by ASTM C1107.

2.02 MIXES

- A. Cement grout:
 1. Use same sand-to-cementitious materials ratio for cement grout mix that is used for concrete mix.
 2. Use same materials for cement grout that are used for concrete.
 3. Use water-to-cementitious materials ratio that is no more than that specified for concrete.
 4. For spreading over surfaces of construction or cold joints.
- B. Cement mortar:
 1. Use same sand-to-cementitious materials ratio for cement mortar mix that is used for concrete mix.
 2. Use same materials for cement mortar that are used for concrete.
 3. Use water-to-cementitious materials ratio that is no more than that specified for concrete being repaired.
 4. At exposed concrete surfaces not to be painted or submerged in water: Use sufficient white cement to make color of finished patch match that of surrounding concrete.
- C. Dry-pack mortar:
 1. Proportions by weight: 1 part Portland cement to 2 parts concrete sand.
 - a. Portland cement: As specified in Section 03300 - Cast-in-Place Concrete.
 - b. Concrete sand: As specified in Section 03300 - Cast-in-Place Concrete.
- D. Epoxy grout:
 1. Consist of mixture of epoxy or epoxy gel and sand.
 - a. Epoxy: As specified in Section 03071 - Epoxies.
 - b. Epoxy gel: As specified in Section 03071 - Epoxies.
 - c. Sand: Clean, bagged, graded, and kiln-dried silica sand.
 2. Proportioning:

- a. For horizontal work: Consist of mixture of 1 part epoxy with not more than 2 parts sand.
 - b. For vertical or overhead work: Consist of 1 part epoxy gel with not more than 2 parts sand.
- E. Grout:
- 1. Mix in proportions by weight: 1 part Portland cement to 4 parts concrete sand.
 - a. Portland cement: As specified in Section 03300 - Cast-in-Place Concrete.
 - b. Concrete sand: As specified in Section 03300 - Cast-in-Place Concrete.
- F. Non-shrink epoxy grout:
- 1. Mix in accordance with manufacturer's installation instructions.
- G. Non-shrink grout:
- 1. Mix in accordance with manufacturer's installation instructions such that resulting mix has flowable consistency and is suitable for placing by pouring.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect concrete surfaces to receive grout or mortar and verify that they are free of ice, frost, dirt, grease, oil, curing compounds, paints, impregnations, and loose material or foreign matter likely to reduce bond or performance of grout or mortar.

3.02 PREPARATION

- A. Surface preparation for grouting other baseplates:
 - 1. Remove grease, oil, dirt, dust, curing compounds, laitance, and other deleterious materials that may affect bond to concrete and bottoms of baseplates.
 - 2. Roughen concrete surfaces in contact with grout to ICRI CSP-6 surface profile or rougher.
 - a. Remove loose or broken concrete.
 - 3. Metal surfaces in contact with grout: Grit blast to white metal surface.

3.03 INSTALLATION

- A. Mixing:
 - 1. Cement grout:
 - a. Use mortar mixer with moving paddles.
 - b. Pre-wet mixer and empty out excess water before beginning mixing.
 - 2. Cement mortar:
 - a. Use mortar mixer with moving paddles.
 - b. Pre-wet mixer and empty out excess water before beginning mixing.
 - 3. Dry-patch mortar:
 - a. Use only enough water so that resulting mortar will crumble to touch after being formed into ball by hand.

4. Non-shrink epoxy grout:
 - a. Keep temperature of non-shrink epoxy grout from exceeding manufacturer's recommendations.
 5. Non-shrink grout:
 - a. May be drypacked, flowed, or pumped into place. Do not overwork grout.
 - b. Do not retemper by adding more water after grout stiffens.
- B. Placement:
1. Cement grout:
 - a. Exercise care in placing cement grout because it is required to furnish structural strength, impermeable water seal, or both.
 - b. Do not use cement grout that has not been placed within 30 minutes after mixing.
 2. Cement mortar:
 - a. Use mortar mixer with moving paddles.
 - b. Pre-wet mixer and empty out excess water before beginning mixing.
 3. Epoxy grouts:
 - a. Wet surfaces with epoxy for horizontal work or epoxy gel for vertical or overhead work prior to placing epoxy grout.
 4. Non-shrink epoxy grout:
 - a. Mix in complete units. Do not vary ratio of components or add solvent to change consistency of mix.
 - b. Pour hardener into resin and mix for at least 1 minute and until mixture is uniform in color. Pour epoxy into mortar mixer wheelbarrow and add aggregate. Mix until aggregate is uniformly wetted. Over mixing will cause air entrapment in mix.
 5. Non-shrink grout:
 - a. Add non-shrink cement grout to premeasured amount of water that does not exceed the manufacturer's maximum recommended water content.
 - b. Mix in accordance with manufacturer's instructions to uniform consistency.
- C. Curing:
1. Cement based grouts and mortars:
 - a. Keep continuously wet for minimum of 7 days. Use wet burlap, soaker hose, sun shading, ponding, and in extreme conditions, combination of methods.
 - b. Maintain above 40 degrees Fahrenheit until it has attained compressive strength of 3,000 pounds per square inch, or above 70 degrees Fahrenheit for minimum of 24 hours to avoid damage from subsequent freezing.
 2. Epoxy based grouts:
 - a. Cure grouts in accordance with manufacturers' recommendations.
 - 1) Do not water cure epoxy grouts.
 - b. Do not allow any surface in contact with epoxy grout to fall below 50 degrees Fahrenheit for minimum of 48 hours after placement.
- D. Grouting equipment bases, baseplates, soleplates, and skids: Grouting equipment bases, baseplates, soleplates, and skids: As shown in the drawings and per manufacturers recommendations.

- E. Grouting other baseplates:
 - 1. General:
 - a. Use non-shrink grout as specified in this Section.
 - b. Baseplate grouting shall take place from 1 side of baseplate to other in continuous flow of grout to avoid trapping air in grout.
 - c. Maintain hydrostatic head pressure by keeping level of grout in headbox above bottom of baseplate. Fill headbox to maximum level and work grout down.
 - d. Vibrate, rod, or chain non-shrink grout to facilitate grout flow, consolidate grout, and remove trapped air.
 - 2. Forms and headboxes:
 - a. Build forms using material with adequate strength to withstand placement of grouts.
 - b. Use forms that are rigid and liquidtight. Caulk cracks and joints with elastomeric sealant.
 - c. Line forms with polyethylene for easy grout release. Coating forms with 2 coats of heavy-duty paste wax is also acceptable.
 - d. Headbox shall be 4 to 6 inches higher than baseplate and shall be located on 1 side of baseplate.
 - e. After grout sets, remove forms and trim back grout at 45 degree angle from bottom edges of baseplate.

3.04 FIELD QUALITY CONTROL

- A. Non-shrink epoxy grout:
 - 1. Test for 24-hour compressive strength in accordance with ASTM C579, Method B.
- B. Non-shrink grout:
 - 1. Test for 24-hour compressive strength in accordance with ASTM C942.

END OF SECTION

SECTION 03926

STRUCTURAL CONCRETE REPAIR

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Repairing damaged structural concrete.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
 - 2. C293 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading).
 - 3. C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars).
 - 4. C666 - Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
 - 5. C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.

1.03 SUBMITTALS

- A. Product data: Submit manufacturer's data completely describing structural repair concrete materials.
- B. Certificates of Compliance.
- C. Manufacturer's instructions.

1.04 QUALITY ASSURANCE

- A. Manufacturer qualifications: The manufacturer of the specified product shall have been in existence for a minimum of 10 years.
- B. Allowable tolerances: Deviation from plumb or level shall not exceed 1/8 inch within 10 feet in any direction, as determined with a 10-foot straight edge.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver the specified product in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers.
- B. Store and condition the specified product as recommended by the manufacturer.

- C. Deliver, store, and handle packaged materials in the manufacturer's original, sealed containers, each clearly identified with the manufacturer's name, and name and type of product.
- D. Store materials subject to damage by dirt and moisture in a clean, dry location, off the ground, and suitably protected.

1.06 PROJECT CONDITIONS

- A. Existing conditions:
 - 1. Hot weather: ACI 305.
 - 2. Cold weather: ACI 306.
 - 3. Do not place concrete repair mortar during precipitation, unless adequate protection is provided.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. General: Structural repair concrete composed of cementitious material capable of being placed in formed vertical and overhead applications, and on horizontal surfaces.
- B. Design requirements:
 - 1. Provide material suitable for performing in environments subject to corrosive attack by chlorides and sulfates, freeze/thaw cycles, low permeability, and abrasion resistant.
 - 2. Provide concrete repair mortar cement that is placeable from 1 inch in depth and extendable in greater depths.
 - 3. Concrete repair mortar shall be capable of being poured in place or troweled in place to suit the conditions encountered.

2.02 MATERIALS

- A. Structural repair concrete:
 - 1. Manufacturers: One of the following or equal:
 - a. Master Builder Solutions/Sika, MasterEmaco S 466Cl.
 - b. Sika Corp., SikaTop 123 Plus.
 - 2. Compressive strength: As follows in accordance with ASTM C109:
 - a. 1 day: 2,500 pounds per square inch, minimum.
 - b. 7 day: 6,000 pounds per square inch, minimum.
 - c. 28 day: 7,000 pounds per square inch, minimum.
 - 3. Bond strength by slant shear: 2,200 pounds per square inch minimum at 28 days, in accordance with ASTM C882 modified.
 - 4. Flexural strength: 2,000 pounds per square inch minimum at 28 days, when tested in accordance with ASTM C293, or 770 pounds per square inch minimum at 28 days when tested in accordance with ASTM C348.
 - 5. Rapid freeze/thaw durability: In accordance with ASTM C666; Procedure A.
 - a. Relative durability factor at 300 cycles: 95 percent minimum.

6. Working time: 30 to 40 minutes.
 7. Color: Concrete gray.
- B. Water: Potable, clean, not detrimental to concrete.
- C. Form materials:
1. Smooth finish: []-
 2. Brace as required to maintain tolerances.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that concrete surfaces and exposed reinforcing are clean and free of contaminants.

3.02 PREPARATION

- A. Prepare existing concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
- B. Thoroughly clean reinforcement and other embedded items to remove loose rust and other objectionable matter.
- C. Thoroughly wet wood forms, except coated plywood, and adjacent concrete at least 1 hour in advance of placing concrete; securely close cleanout end inspection ports; repeat wetting as necessary to keep forms damp.
- D. Damaged concrete:
1. Areas to be repaired shall be clean, sound, and free of contaminants.
 - a. Remove loose and deteriorated concrete by mechanical means acceptable to the Engineer.
 - b. Saw cut perimeter 1/2-inch maximum.
 2. Chip concrete substrate to obtain a surface profile of 1/16 inch to 1/8 inch in depth with a new fractured aggregate surface.
 - a. Area to be repaired shall be not less than 1 inch in depth.
 3. Concrete removal shall extend along the reinforcing steel to locations along the bar free of bond inhibiting corrosion, and where the bar is well bonded to surrounding concrete.
- E. Use the following procedures where reinforcing steel with active corrosion is encountered:
1. Sandblast reinforcing steel to remove contaminants and rust.
 2. Determine section loss, splice new reinforcing steel where there is more than 15 percent loss as directed by the Engineer.
 - a. If more than half the diameter of the reinforcing steel is exposed, chip out behind the reinforcing steel a minimum of 1/2 inch. Distance chipped behind the reinforcing steel must also equal or exceed the minimum placement depth of the accepted material.

- F. Treat cracks in the substrate at the area of patching or overlay work as directed by the Engineer.
- G. Extend existing control and expansion joints through any concrete repair.
- H. Apply an epoxy-bonding agent to area to be repaired, as specified in Section 03071 - Epoxies, prior to patching concrete with polymer-modified Portland cement mortar.

3.03 MIXING

- A. Mix in accordance with manufacturer's mixing instructions.

3.04 INSTALLATION

- A. Formed surface finishes:
 - 1. Smooth finish:
 - a. Obtain by the use of plywood, sheet metal, or lined wood forms; no fins, pockmarks, or other irregularities shall be present in the exposed surfaces of concrete.
 - b. Place no structural repair concrete without prior authorization of the Engineer.
- B. Verify that form materials are in place and ready to receive installation of concrete repair material.
- C. Install in accordance with manufacturer's installation instructions.
- D. In accordance with ACI recommendations, apply concrete repair material only when ambient conditions of moisture, temperature, humidity, and wind are favorable for curing.
- E. Scrub mortar into substrate, filling cracks, voids, and pores.
- F. For new construction, finish of repaired area shall match required finish for concrete being repaired.
- G. For existing concrete, finish of repair area shall match finish of concrete being repaired.
- H. During the curing process, protect concrete repair from rain, wind, or freezing as required:
 - 1. Keep sufficient covering on hand at all times for protection of repair concrete.

3.05 CLEANING

- A. Remove debris and excess material. Leave work site in a neat, clean condition.

END OF SECTION

SECTION 03931
EPOXY INJECTION SYSTEM

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
1. Epoxy injection system.

1.02 REFERENCES

- A. ASTM International (ASTM):
1. C881 - Standard Test Method for Epoxy-Resin-Base Bonding Systems for Concrete.
 2. C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete by Slant Shear.
 3. D638 - Standard Test Method for Tensile Properties of Plastics.
 4. D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
 5. D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
 6. D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- B. NSF International (NSF):
1. 61 - Drinking Water System Components - Health Effects.

1.03 SUBMITTALS

- A. Submit as specified in Section 01330 - Submittal Procedures.
- B. Product data:
1. Manufacturer's data completely describing epoxy injection system materials and including test methods and results for strength in tension, flexure, compression and bond; flexural modulus of elasticity; coefficient of thermal expansion; and elongation.
 2. Data demonstrating that products are listed under NSF-61 for use in direct contact with potable water.
- C. Quality control submittals:
1. Certificates of Compliance.
 2. Manufacturer's Instructions.
- D. Special procedure submittals:
1. Protection plan for surrounding areas and non-cementitious surfaces.

1.04 QUALITY ASSURANCE

- A. Products:
 - 1. Provide materials that are new and use them within shelf life limitations set forth by manufacturer.
- B. Qualifications:
 - 1. Installer:
 - a. Minimum 5 years' experience in concrete repair, with focus on application of similar systems and products to projects of similar size and scope.
- C. Pre-installation meeting:
 - 1. At least 1 week prior to commencing work of this Section, convene a meeting at the project site to review and discuss the following:
 - a. Surface preparation.
 - b. Substrate conditioning and pre-treatment.
 - c. Installation procedures.
 - d. Environmental conditions (including weather forecast) and curing requirements.
 - e. Testing and inspection procedures.
 - f. Protection of surrounding surfaces and equipment.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Labels shall include product identification, batch numbers, and shelf life information.
- B. Store materials off the ground and away from moisture and direct sunlight, and at temperatures within manufacturer's recommended range.
- C. Pre-condition materials to manufacturer's recommended temperatures before mixing and using.

1.06 PROJECT CONDITIONS

- A. Take precautions to protect surfaces and equipment in the work area from damage and staining.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General:
 - 1. Repair materials shall be free of chlorides or alkalis (except for those attributed to water).
 - 2. To ensure compatibility of materials and methods, a single manufacturer shall produce and provide all products used together in a single area of concrete repair.
 - 3. Listed under NSF-61 for use in direct contact with potable water.

- B. Manufacturers: One of the following, or equal:
1. Sika Chemical Corp., Sikadur 35 Hi-Mod LV.
- C. Epoxy:
1. In accordance with ASTM C881, Types I, II and IV, Grade 1, Class C.
 2. Water-insensitive 2-component low viscosity, epoxy adhesive material containing 100 percent solids and meeting or exceeding following characteristics when tested in accordance with standards specified:

Table 1. Epoxy, Physical Properties		
Characteristic	Test Method	Required Results, minimum^{(1),(2)}
Viscosity (mixed)	--	250 to 375 centipoise
Tensile Strength	ASTM D638	7,500 pounds per square inch
Tensile Elongation at Break	ASTM D638	1 percent
Compressive Strength	ASTM D695	11,000 pounds per square inch
Compressive Modulus	ASTM D695	2.5 x 10 ⁵ pounds per square inch
Bond Strength, slant shear, hardened concrete to hardened concrete	ASTM C882	1,500 pounds per square inch at 2 days at minimum 73 degrees Fahrenheit. Concrete shall fail before failure of epoxy.
Heat Deflection Temperature	ASTM D648	124 degrees Fahrenheit
Notes:		
(1) Properties for mixes with neat epoxy.		
(2) Results after 7-day cure at temperature between 72 and 78 degrees Fahrenheit, unless otherwise noted.		

2.02 EQUIPMENT

- A. Injection pump:
1. Use positive displacement injection pump with interlock to provide in-line mixing and metering system for 2 component epoxy.
 2. Use pressure hoses and injection nozzle designed to properly mix of 2 components of epoxy.
 3. Standby injection unit may be required.

PART 3 EXECUTION

3.01 PREPARATION

- A. Surface preparation:
1. Confirm that surface temperature and moisture conditions are within manufacturer's recommended limits. Condition surfaces to within those limits before commencing epoxy injection.
 2. Sweep or clean area in vicinity of cracks that will be injected with epoxy. Leave area in generally clean condition after epoxy injection is complete.
 3. Clean cracks so they are free from dirt, laitance, and other loose matter.

3.02 INSTALLATION

- A. Install and cure epoxy materials in accordance with manufacturer's installation instructions.
- B. Mixing:
 - 1. Mix epoxy in accordance with manufacturer's installation instructions.
 - 2. Do not use solvents to thin epoxy system materials introduced into cracks or joints.
- C. Injection:
 - 1. Apply adequate surface seal to crack to prevent leakage of epoxy.
 - 2. Establish injection points at distance along crack not less than thickness of cracked member.
 - 3. Crack injection sequence:
 - a. Inject epoxy into crack or joint at first port with sufficient pressure to advance epoxy to adjacent port. Start at lowest port along the injection line and work upwards.
 - b. Seal original port and shift injection to next adjacent port where epoxy appears.
 - c. Continue port-to-port injection until crack has been injected for its entire length.
 - d. For small amounts of epoxy, or where excessive pressure developed by injection pump might further damage structure, premixed epoxy and use hand caulking gun to inject epoxy if acceptable to the Engineer.
 - e. Seal ports, including adjacent locations where epoxy seepage occurs, as necessary to prevent drips or run out.
 - f. After epoxy injection is complete, remove surface seal material, and refinish concrete in area where epoxy was injected to match existing concrete. Leave finished work and work area in a neat, clean condition.

3.03 FIELD QUALITY ASSURANCE

- A. Provide Contractor quality control as specified in Section 01450 - Quality Control.
- B. Field inspections and testing:
 - 1. Submit records of inspections and tests to Engineer within 24 hours after completion.
- C. Manufacturer's services.
 - 1. Pre-installation meeting: Provide manufacturer's technical representative to attend pre-installation meeting specified in this Section.

3.04 FIELD QUALITY CONTROL

- A. Provide Owner's quality assurance for the Work of this Section as specified in Section 01450 - Quality Control.
- B. Special inspections special tests, and structural observation:
 - 1. Not required.

- C. Field inspections:
 - 1. Preparation.
 - a. Review manufacturer's product data and installation instructions.
 - 2. Required inspections.
 - a. Observe surfaces to be injected for temperature and moisture conditions and for surface preparation.
 - b. Observe conditioning and mixing of epoxy resin components.
 - c. Observe injection procedures for filling cracks.
 - 3. Records of inspections:
 - a. Provide record of each inspection.
 - b. Submit to Engineer upon request.

3.05 NON-CONFORMING WORK

- A. Rework surface finishes that do not match surrounding concrete to the satisfaction of the Engineer at no additional cost to the Owner.

END OF SECTION

SECTION 05190

MECHANICAL ANCHORING AND FASTENING TO CONCRETE AND MASONRY

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Cast-in anchors and fasteners:
 - a. Anchor bolts.
 - b. Anchor rods.
 - c.
 - 2. Post-installed steel anchors and fasteners:
 - a. Concrete anchors.
 - b. Sleeve anchors.
 - c. Undercut concrete anchors.
 - 3. Appurtenances for anchoring and fastening:
 - a. Anchor bolt sleeves.
 - b. Isolating sleeves and washers.
 - c. Thread coating for threaded stainless steel fasteners.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. 355.2 - Qualification of Post-Installed Mechanical Anchors in Concrete & Commentary.
- B. American National Standards Institute (ANSI):
 - 1. B212.15 - Cutting Tools - Carbide-tipped Masonry Drills and Blanks for Carbide-tipped Masonry Drills.
- C. American Welding Society (AWS):
 - 1. D1.1 - Structural Welding Code - Steel.
 - 2. D1.6 - Structural Welding Code - Stainless Steel.
- D. ASTM International (ASTM):
 - 1. A29 - Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought, General Requirements for.
 - 2. A36 - Standard Specification for Carbon Structural Steel.
 - 3. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 4. A108 - Standard Specification for Steel Bars, Carbon and Alloy, Cold Finished.
 - 5. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 6. A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

7. A240 - Standard Specification for Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 8. A380 - Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
 9. A563 - Standard Specification for Carbon and Alloy Steel Nuts.
 10. A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 11. B633 - Standard Specification for *Electrodeposited* Coatings of Zinc on Iron and Steel.
 12. B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
 13. E488 - Standard Test Methods for Strength of Anchors in Concrete Elements.
 14. F436 - Standard Specification for Hardened Steel Washers.
 15. F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
 16. F594 - Standard Specification for Stainless Steel Nuts.
 17. F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength.
 18. F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- E. International Code Council Evaluation Service, Inc. (ICC-ES):
1. AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements.

1.03 DEFINITIONS

- A. Built-In Anchor: Headed bolt or assembly installed in position before filling surrounding masonry units with grout.
- B. Cast-In Anchor: Headed bolt or assembly installed in position before placing plastic concrete around.
- C. Overhead Installations: Fasteners installed on overhead surfaces where the longitudinal axis of the fastener is more than 60 degrees above a horizontal line so that the fastener resists sustained tension loads.
- D. Passivation: Chemical treatment of stainless steel with a mild oxidant for the purpose of enhancing the spontaneous formation of the steel's protective passive film.
- E. Post-Installed Anchor: Fastener or assembly installed in hardened concrete or finished masonry construction, typically by drilling into the structure and inserting a steel anchor assembly.
- F. Terms relating to structures or building environments as used with reference to anchors and fasteners:
 1. Corrosive locations: Describes interior and exterior locations as follows:
 - a. Locations used for delivery, storage, transfer, or containment (including spill containment) of chemicals used for plant treatment processes.

- b. Exterior and interior locations at the following treatment structures:
 - 1) Water treatment facilities: Liquids stream:All Structures
- 2. Wet and moist locations: Describes locations, other than “corrosive locations,” that are submerged, are immediately above liquid containment structures, or are subject to frequent wetting, splashing, or wash down. Includes:
 - a. Exterior portions of buildings and structures.
 - b. Liquid-containing structures:
 - 1) Locations at and below the maximum operating liquid surface elevation.
 - 2) Locations above the maximum operating liquid surface elevation and:
 - a) Below the top of the walls containing the liquid.
 - b) At the inside faces and underside surfaces of a structure enclosing or spanning over the liquid (including walls, roofs, slabs, beams, or walkways enclosing the open top of the structure).
 - c. Liquid handling equipment:
 - 1) Bases of pumps and other equipment that handles liquids.
 - d. Indoor locations exposed to moisture, splashing, or routine wash down during normal operations, including floors with slopes toward drains or gutters.
 - e. Other locations indicated on the Drawings.
- 3. Other locations:
 - a. Interior dry areas where the surfaces are not exposed to moisture or humidity in excess of typical local environmental conditions.

1.04 SUBMITTALS

- A. General:
 - 1. Submit information listed for each type of anchor or fastener to be used.
- B. Action submittals:
 - 1. Product data:
 - a. Cast-in anchors:
 - 1) Manufacturer’s data including catalog cuts showing anchor sizes and configuration, materials, and finishes.
 - b. Post-installed anchors:
 - 1) For each anchor type, manufacturer’s data including catalog cuts showing anchor sizes and construction, materials and finishes, and load ratings.
 - 2. Samples:
 - a. Samples of each type of anchor, including representative diameters and lengths, if requested by the Engineer.
 - 3. Certificates:
 - a. Cast-in anchors:
 - 1) Mill certificates for steel anchors that will be supplied to the site.
 - b. Post-installed anchors:
 - 1) Manufacturer’s statement or certified test reports demonstrating that anchors that will be supplied to the site comply with the materials properties specified.

4. Test reports:
 - a. Post-installed anchors: For each anchor type used for the Work:
 - 1) Current ICC-ES Report (ESR), or equivalent acceptable to the Engineer and the authority having jurisdiction, demonstrating:
 - a) Acceptance of that anchor for use under the building code specified in Section 01410 - Regulatory Requirements.
 - b) That testing of the concrete anchor included the simulated seismic tension and shear tests of AC193, and that the anchor is accepted for use in Seismic Design Categories C, D, E, or F and with cracked concrete.
5. Manufacturer's instructions:
 - a. Requirements for storage and handling.
 - b. Recommended installation procedures including details on drilling, hole size (diameter and depth), hole cleaning and preparation procedures, anchor insertion, and anchor tightening.
 - c. Requirements for inspection or observation during installation.
6. Qualification statements:
 - a. Post-installed anchors: Installer qualifications:
 - 1) Submit list of personnel performing installations and include date of manufacturer's training for each.

1.05 QUALITY ASSURANCE

- A. Qualifications:
 1. Post installed anchors shall be in accordance with building code specified in Section 01410 - Regulatory Requirements.
 - a. Installations shall be performed by trained installers having at least 3 years of experience performing similar installations with similar types of anchors.
- B. Special inspection:
 1. Provide special inspection of post-installed anchors as specified in Section 01455 - Regulatory Quality Assurance and this Section.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver post-installed anchors in manufacturer's standard packaging with labels visible and intact. Include manufacturer's installation instructions.
- B. Handle and store anchors and fasteners in accordance with manufacturer's recommendations and as required to prevent damage.
- C. Protect anchors from weather and moisture until installation.

1.07 PROJECT CONDITIONS

- A. Seismic Design Category (SDC) for structures is indicated on the Drawings.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. General:

1. Furnish threaded fasteners with flat washers and hex nuts fabricated from materials corresponding to the material used for threaded portion of the anchor.
 - a. Cast-in anchors: Provide flat washers and nuts as listed in the ASTM standard for the anchor materials specified.
 - b. Post-installed anchors: Provide flat washers and nuts supplied for that product by the manufacturer of each anchor.
2. Size of anchors and fasteners, including diameter and length or minimum effective embedment depth: As indicated on the Drawings or as specified in this Section. In the event of conflicts, contact Engineer for clarification.
3. Where anchors and connections are not specifically indicated on the Drawings or specified, their material, size and form shall be equivalent in quality and workmanship to items specified.

B. Materials:

1. Provide and install anchors of materials as in this Section.

2.02 CAST-IN ANCHORS AND FASTENERS

A. Anchor bolts:

1. Description:
 - a. Straight steel rod having one end with an integrally forged head, and one threaded end. Embedded into concrete with the headed end cast into concrete at the effective embedment depth indicated on the Drawings or specified, and with the threaded end left to project clear of concrete face as required for the connection to be made.
 - b. Furnish anchor bolts with heavy hex forged head or equivalent acceptable to Engineer.
 - 1) Rods or bars with angle bend for embedment in concrete (i.e., "L" or "J" shaped anchor bolts) are not permitted in the Work.
2. Materials:
 - a. Ship anchor bolts with properly fitting nuts attached.
 - b. Type 316 stainless steel:
 - 1) Surfaces descaled, pickled, and passivated in accordance with ASTM A380.
 - 2) Bolts: ASTM F593, Group 2, Condition CW, coarse threads.
 - 3) Nuts: ASTM F594. Match alloy (group and UNS designation) and threads of bolts.
 - 4) Washers: Type 316 stainless steel.
 - c. Galvanized steel:
 - 1) Hot-dip galvanized coating in accordance with ASTM F2329.
 - 2) Bolt: ASTM F1554, Grade 36,, heavy hex, coarse thread.
 - 3) Nuts: ASTM A563, Grade A,, heavy hex, threads to match bolt.
 - 4) Washers: ASTM F436, Type 1.

- B. Anchor rods:
 - 1. Description: Straight steel rod having threads on each end[or continuously threaded from end to end]. One threaded end is fitted with nuts or plates and embedded in concrete to the effective depth indicated on the Drawings, leaving the opposite threaded end to project clear of the concrete face as required for the connection to be made at that location.
 - 2. Materials:
 - a. Stainless steel: Type 316:
 - 1) Surfaces descaled, pickled, and passivated in accordance with ASTM A380.
 - 2) Rod: ASTM F593, Group 2, Condition CW, coarse threads.
 - 3) Nuts: ASTM F594. Match alloy (group and UNS designation) and threads of rods.
 - 4) Washers: Type 316 stainless steel.
 - 5) Plates (embedded): ASTM A240.
 - b. Galvanized: steel:
 - 1) Hot-dip galvanized with coating in accordance with ASTM F2329.
 - 2) Rod: ASTM F1554, Grade 36, coarse thread.
 - 3) Nuts: ASTM A563, Grade A, threads to match rod.
 - 4) Washers: ASTM F436, Type 1.
 - 5) Plates (embedded): ASTM A36.
- C. Steel plates or shapes for fabrications including assemblies with welded studs or deformed bar anchors:
 - 1. Stainless steel: Type 316L or Type 304L:
 - a. Plates (embedded): ASTM A240.
 - 2. Galvanized steel:
 - a. Hot dip galvanized in accordance with ASTM A123.
 - b. Steel: ASTM A36.

2.03 POST-INSTALLED ANCHORS AND FASTENERS - ADHESIVE

- A. Epoxy bonding of reinforcing bars, all thread rods, and threaded inserts in concrete
As required.

2.04 POST-INSTALLED ANCHORS AND FASTENERS - MECHANICAL

- A. General:
 - 1. Post-installed anchors used for the Work shall hold a current ICC Evaluation Service Report demonstrating acceptance for use under the building code specified in Section 01410 - Regulatory Requirements.
 - a. Conditions of use: The acceptance report shall indicate acceptance of the product for use under the following conditions:
 - 1) In regions of concrete where cracking has occurred or may occur.
 - 2) To resist short-term loads due to wind forces.
 - 3) To resist short-term loading due to seismic forces for the Seismic Design Category of the structure where the product will be used.

2. Substitutions: When requesting product substitutions, submit calculations, indicating the diameter, effective embedment depth and spacing of the proposed anchors, and demonstrating that the substituted product will provide load resistance that is equal to or greater than that provided by the anchors listed in this Section.
 - a. Calculations shall be prepared by and shall bear the signature and seal of a Professional Engineer licensed in the State of Texas.
 - b. Decisions regarding the acceptability of proposed substitutions shall be at the discretion of the Engineer.
- B. Concrete anchors:
1. Description. Post-installed anchor assembly consisting of a threaded stud and a surrounding wedge expansion sleeve that is forced outward by torquing the center stud to transfer loads from the stud to the concrete through bearing, friction, or both. (Sometimes referred to as “expansion anchors” or “wedge anchors.”)
 - a. Do not use slug-in, lead cinch, and similar systems relying on deformation of lead alloy or similar materials to develop holding power.
 2. Concrete anchors for anchorage to concrete:
 - a. Acceptance criteria:
 - 1) Concrete anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for short-term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and with ICC-ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).
 - 2) Concrete anchor performance in the current ICC-ES Report shall be “Category 1” as defined in ACI 355.2.
 - b. Manufacturers: One of the following or equal:
 - 1) Hilti, Kwik Bolt TZ Expansion Anchor.
 - 2) DEWALT/Powers, PowerStud.
 - 3) Simpson Strong-Tie, Strong Bolt 2 Wedge Anchor.
 - c. Materials. Integrally threaded stud, wedge, washer, and nut:
 - 1) Stainless steel: Type 316.
 - 2) Galvanized: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5).
- C. Flush shells:
1. Description: Post-installed anchor assembly consisting of an internally threaded mandrel that is forced into a pre-drilled concrete hole with a setting tool until the top of the anchor is flush with the face of the concrete. Once installed, a removable threaded bolt is installed in the mandrel.
 2. Flush shell anchors are not permitted in the Work.

- D. Sleeve anchors:
1. Description: Post-installed, torque-controlled anchor assembly consisting of an externally threaded stud with a spacer sleeve near the surface of the base material, and an expansion sleeve on the lower part of the stud. The expansion sleeve is forced outward by torquing of the center stud to transfer load.
 - a. Do not use slug-in, lead cinch, and similar systems relying on deformation of lead alloy or similar materials in order to develop holding power.
 2. Sleeve anchors for anchorage to concrete:
 - a. Acceptance criteria:
 - 1) Sleeve anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for short-term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and with ICC-ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).
 - 2) Sleeve anchor performance in the current ICC-ES Report shall be "Category 1" as defined in ACI 355.2.
 - b. Manufacturers: One of the following or equal:
 - 1) Hilti, HSL-3 Heavy Duty Expansion (sleeve) Anchor.
 - 2) DEWALT/Powers, Power Bolt+ Heavy Duty Sleeve Anchor.
 - c. Materials:
 - 1) Stainless steel: Not available.
 - 2) Galvanized steel: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5).
- E. Undercut concrete anchors:
1. Description: Post-installed concrete anchor that develops tensile strength from mechanical interlock provided by creation of an undercut "key" at the embedded end of the anchor. The undercut may be achieved with a special drill before anchor installation, or by the anchor itself during installation.
 2. Acceptance criteria:
 - a. Acceptance criteria:
 - 1) Undercut concrete anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for short-term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and ICC ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).
 - 2) Undercut anchor performance in the current ICC-ES Report shall be "Category 1" as defined in ACI 355.2.
 - b. Use pre-setting units. Through-setting units are not allowed unless prior written acceptance for specific locations is obtained from the Engineer.
 3. Manufacturers: One of the following or equal:
 - a. Hilti, HDA (carbon steel) or HDA-R (stainless steel) Undercut Anchor.
 - b. Powers Fasteners, Atomic+ Undercut Anchor.
 - c. Simpson Strong-Tie, Torq-Cut Anchor.
 - d. USP Structural Connectors, DUC-L Undercut Anchors.

4. Materials:
 - a. Stainless steel: Corrosive, wet, and moist and locations: Type 316.
 - b. Galvanized: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5).

2.05 APPURTENANCES FOR ANCHORING AND FASTENING

- A. Anchor bolt sleeves:
 1. Having inside diameter approximately 2 inches greater than bolt diameter and minimum 10-bolt diameters long.
 2. Plastic sleeves:
 - a. High-density polyethylene, corrugated sleeve, threaded to provide adjustment of location on the anchor bolt.
 - b. Manufacturers: The following or equal:
 - 1) Portland Bolt & Manufacturing Co.
 - c.
 3. Fabricated steel sleeves:
 - a. Fabricate to the following dimensions unless otherwise indicated on the Drawings:
 - 1) Inside diameter: At least 2 inches greater than bolt diameter.
 - 2) Inside length: Not less than 10 bolt diameters.
 - 3) Bottom plate:
 - a) Square plate with dimensions equal to the outside diameter of the sleeve plus 1/2 inch each side.
 - b) Thickness equal to or greater than one-half of the anchor bolt diameter.
 - b. Carbon steel anchor bolts:
 - 1) Fabricated from ASTM A36 plate and ASTM A53, Grade B pipe.
 - 2) Welded connections: Conform to requirements of AWS D1.1.
 - 3) Hot dip galvanized in accordance with ASTM A153.
 - c. Stainless steel anchor bolts:
 - 1) Fabricated from ASTM A240 plate and pipe. Type 304L or Type 316L to match Type of the anchor bolt.
 - 2) Welded connections: In accordance with AWS D1.6.
- B. Isolating sleeves and washers:
 1. Manufacturers: One of the following or equal:
 - a. Central Plastics Co.
 - b. Allied Corrosion Industries.
 2. Sleeves: Mylar, 1/32-inch thick, 4,000 volts per mil dielectric strength, of proper size to fit bolts and extending half way into both steel washers.
 3. One sleeve required for each bolt.
 4. Washers: The inside diameter of all washers shall fit over the isolating sleeve, and both the steel and isolating washers shall have the same inside diameter and outside diameter.
 - a. Proper size to fit bolts.
 - b. Two 1/8-inch thick steel washers for each bolt.
 - c. G3 Phenolic: 2 insulating washers are required for each bolt:
 - 1) Thickness: 1/8 inch.
 - 2) Base material: Glass.
 - 3) Resin: Phenolic.

- 4) Water absorption: 2 percent.
 - 5) Hardness (Rockwell): 100.
 - 6) Dielectric strength: 450 volts per mil.
 - 7) Compression strength: 50,000 pounds per square inch.
 - 8) Tensile strength: 20,000 pounds per square inch.
 - 9) Maximum operating temperature: 350 degrees Fahrenheit.
- C. Coating for repair of galvanized surfaces:
1. Manufacturers: The following or equal:
 - a. Jelt, Galvinox.
- D. Thread coating: For use with threaded stainless steel fasteners:
1. Manufacturers: One of the following or equal:
 - a. Bostik, Never-Seez.
 - b. Oil Research, Inc., WLR No. 111.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine Work in place to verify that it is satisfactory to receive the Work of this Section. If unsatisfactory conditions exist, do not begin this Work until such conditions have been corrected.

3.02 INSTALLATION: GENERAL

- A. Where anchors and fasteners are not specifically indicated on the Drawings or specified, make attachments with materials specified in this Section.
- B. Substitution of anchor types:
1. Post-installed anchors may not be used as an alternative to cast-in/built-in anchors at locations where the latter are indicated on the Drawings.
 2. Cast-in/built-in anchors may be used as an alternative to post-installed mechanical anchors at locations where the latter are indicated on the Drawings.
- C. Protect products from damage during installation. Take special care to protect threads and threaded ends.
- D. Accurately locate and position anchors and fasteners:
1. Unless otherwise indicated on the Drawings, install anchors perpendicular to the surfaces from which they project.
 2. Install anchors so that at least 2 threads, but not more than 1/2 inch of threaded rod, projects past the top nut.

- E. Interface with other products:
 - 1. Where steel anchors come in contact with dissimilar metals (aluminum, stainless steel, etc.), use stainless steel anchors and separate or isolate dissimilar metals using isolating sleeves and washers.
 - 2. Prior to installing nuts, coat threads of stainless steel fasteners with thread coating to prevent galling of threads.

3.03 INSTALLATION: CAST-IN ANCHORS

- A. General:
 - 1. Accurately locate cast-in and built-in anchors.
 - a. Provide anchor setting templates to locate anchor bolts and anchor rods. Secure templates to formwork.
 - b. Brace or tie off embedments as necessary to prevent displacement during placement of plastic concrete or of surrounding masonry construction.
 - c. Position and tie cast-in and built-in anchors in place before beginning placement of concrete or grout. Do not “stab” anchors into plastic concrete, mortar, or grout.
 - d. Do not allow cast-in anchors to touch reinforcing steel. Where cast-in anchors are within 1/4 inch of reinforcing steel, isolate the metals by wrapping the anchors with a minimum of 4 wraps of 10-mil polyvinyl chloride tape in area adjacent to reinforcing steel.
 - 2. For anchoring at machinery bases subject to vibration, use 2 nuts, with 1 serving as a locknut.
 - 3. Where anchor bolts or anchor rods are indicated on the Drawings as being for future use, thoroughly coat exposed surfaces that project from concrete or masonry with non-oxidizing wax. Turn nuts down full length of the threads, and neatly wrap the exposed thread and nut with a minimum of 4 wraps of 10-mil waterproof polyvinyl tape.
- B. Anchor bolts:
 - 1. Minimum effective embedment: 10-bolt diameters, unless a longer embedment is indicated on the Drawings.
- C. Anchor rods:
 - 1. Install as specified for anchor bolts.

3.04 INSTALLATION: POST-INSTALLED ADHESIVE ANCHORS

- A. Epoxy and acrylic adhesive bonding of reinforcing bars, all thread rods, and internally threaded inserts in concrete.

3.05 INSTALLATION: POST-INSTALLED MECHANICAL ANCHORS

- A. General:
 - 1. Install anchors in accordance with the manufacturer’s instructions, ACI 355.2, the anchor’s ICC-ES Report. Where conflict exists between the ICC-ES Report and the requirements in this Section, the requirements of the ICC-ES Report shall control.
 - 2. Where anchor manufacturer recommends the use of special tools and/or specific drill bits for installation, provide and use such tools.

3. After anchors have been positioned and inserted into concrete or masonry, do not:
 - a. Remove and reuse/reinstall anchors.
 - b. Loosen or remove bolts or studs.

- B. Holes drilled into concrete and masonry:
 1. Do not drill holes in concrete or masonry until the material has achieved its minimum specified compression strength (f'_c or f'_m).
 2. Accurately locate holes:
 - a. Before drilling holes, use a reinforcing bar locator to identify the position of all reinforcing steel, conduit, and other embedded items within a **6**-inch radius of each proposed hole.
 - b. If the hole depth exceeds the range of detection for the rebar locator, the Engineer may require radiographs of the area designated for investigation before drilling commences.
 3. Exercise care to avoid damaging existing reinforcement and other items embedded in concrete and masonry.
 - a. If embedments are encountered during drilling, immediately stop work and notify the Engineer. Await Engineer's instructions before proceeding.
 4. Unless otherwise indicated on the Drawings, drill holes perpendicular to the concrete surface into which they are placed.
 5. Drill using anchor manufacturer's recommended equipment and procedures:
 - a. Unless otherwise recommended by the manufacturer, drill in accordance with the following:
 - 1) Drilling equipment: Electric or pneumatic rotary type with light or medium impact. Where edge distances are less than 2 inches, use lighter impact equipment to prevent micro-cracking and concrete spalling during drilling process.
 - 2) Drill bits: Carbide-tipped in accordance with ANSI B212-15. Hollow drills with flushing air systems are preferred.
 6. Drill holes at manufacturer's recommended diameter and to depth required to provide the effective embedment indicated.
 7. Clean and prepare holes as recommended by the manufacturer and as required by the ICC-ES Report for that anchor.
 - a. Unless otherwise recommended by anchor manufacturer, remove dust and debris using brushes and clean compressed air.
 - b. Repeat cleaning process as required by the manufacturer's installation instructions.
 - c. When cleaning holes for stainless steel anchors, use only stainless steel or non-metallic brushes.

- C. Insert and tighten (or torque) anchors in full compliance with the manufacturer's installation instructions.
 1. Once anchor is tightened (torque), do not attempt to loosen or remove its bolt or stud.

- D. Concrete anchors: Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Concrete Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum Member Thickness
	In Concrete	In Grouted Masonry	
3/8 inch	2 1/2 inch	2 5/8 inch	8 inch
1/2 inch	3 1/2 inch	3 1/2 inch	8 inch
5/8 inch	4 1/2 inch	4 1/2 inch	10 inch
3/4 inch	5 inch	5 1/4 inch	12 inch

E. Flush shell anchors:

1. Flush shell anchors are not permitted in the Work.
2. If equipment manufacturer's installation instructions recommend the use of flush shell anchors, contact Engineer for instructions before proceeding.

F. Sleeve anchors:

1. Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Sleeve Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum Member Thickness
	In Concrete	In Grouted Masonry	
M8 (1/2 inch)	70 mm (2 3/4 inch)	Not accepted	100 mm (8 inch)
M10 (5/8 inch)	76 mm (3 inch)	Not accepted	250 mm (10 inch)
M12 (3/4 inch)	80 mm (3 1/4 inch)	Not accepted	300 mm (12 inch)

2. Install with the sleeve fully engaged in the base material.

G. Screw anchors:

1. Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Screw Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum Member Thickness
	In Concrete	In Grouted Masonry	
3/8 inch	2 1/2 inch	3 1/4 inch	8 inch
1/2 inch	3 1/4 inch	4 1/2 inch	8 inch
5/8 inch	4 inch	5 inch	10 inch
3/4 inch	5 1/2 inch	6 1/4 inch	12 inch

1. Install screw anchors using equipment and methods recommended by the manufacturer. Continue driving into hole until the washer head is flush against the item being fastened.

- H. Undercut concrete anchors:
1. Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Undercut Anchors			
Nominal Diameter (bolt)	Minimum Effective Embedment Length		Minimum Member Thickness⁽¹⁾
	In Concrete	In Grouted Masonry	
M10 (3/8 inch)	100 mm (4 inch)	Not accepted	200 mm (8 inch)
M12 (1/2 inch)	125 mm (5 inch)	Not accepted	350 mm (14 inch)
M16 (5/8 inch)	190 mm (7 1/2 inch)	Not accepted	460 mm (18 inch)
M20 (7/8 inch)	250 mm (10 inch)	Not accepted	510 mm (20 inch)

Notes:

(1) Thickness indicated is for pre-set units. If through-set units are accepted, obtain minimum member thickness requirements from the Engineer.

2. Installations of undercut anchors shall not be allowed where edge distances are less than **12** times the nominal diameter of the anchor stud.
3. Undercut bottom of hole using cutting tools manufactured for this purpose by the manufacturer of the undercut anchors being placed.

3.06 FIELD QUALITY CONTROL

- A. Contractor shall provide quality control over the Work of this Section as specified in Section 01450 - Quality Control.
1. Expenses associated with work described by the following paragraphs shall be paid by the Contractor.
- B. Post-installed anchors:
1. Review anchor manufacturer's installation instructions and requirements of the Evaluation Service Report (hereafter referred to as "installation documents") for each anchor type and material.
 2. Observe hole-drilling and cleaning operations for conformance with the installation documents.
 3. Certify in writing to the Engineer that the depth and location of anchor holes, and the torque applied for setting the anchors conforms to the requirements of the installation documents.
 - a.

3.07 FIELD QUALITY ASSURANCE

- A. Owner's Representative will provide on-site observation and field quality assurance for the Work of this Section.
1. Expenses associated with work described by the following paragraphs shall be paid by the Owner.

- B. Field inspections and special inspections:
1. Required inspections: Observe construction for conformance to the approved Contract Documents, the accepted submittals, and manufacturer's installation instructions for the products used.
 2. Record of inspections:
 - a. Maintain record of each inspection.
 - b. Submit copies to Engineer upon request.
 3. Statement of special inspections: At the end of the project, prepare and submit to the Engineer and the authority having jurisdiction inspector's statement that the Work was constructed in general conformance with the approved Contract Documents, and that deficiencies observed during construction were resolved.
- C. Special inspections: Anchors cast into concrete and built into masonry.
1. Provide special inspection during positioning of anchors and placement of concrete or masonry (including mortar and grout) around the following anchors:
 - a. Anchor bolts.
 - b. Anchor rods.
 - c. Deformed bar anchors.
 2. During placement, provide continuous special inspection at each anchor location to verify that the following elements of the installation conform to the requirements of the Contract Documents.
 - a. Anchor:
 - 1) Type and dimensions.
 - 2) Material: Galvanized steel, Type 304 stainless steel, or Type 316 stainless steel as specified in this Section or indicated on the Drawings.
 - 3) Positioning: Spacing, edge distances, effective embedment, and projection beyond the surface of the construction.
 - 4) Reinforcement at anchor: Presence, positioning, and size of additional reinforcement at anchors indicated on the Drawings.
 3. Following hardening and curing of the concrete or masonry surrounding the anchors, provide periodic special inspection to observe and confirm the following:
 - a. Base material (concrete or grouted masonry):
 - 1) Solid and dense concrete or grouted masonry material within required distances surrounding anchor.
 - 2) Material encapsulating embedment is dense and well-consolidated.
- D. Special Inspections: Post-installed mechanical anchors placed in hardened concrete and in grouted masonry.
1. Provide special inspection during installation of the following anchors:
 - a. Concrete anchors.
 - b. Sleeve anchors.
 - c. Screw anchors.
 - d. Undercut concrete anchors.
 2. Unless otherwise noted, provide periodic special inspection during positioning, drilling, placing, and torquing of anchors.
 - a. Provide continuous special inspection for post-installed anchors in "overhead installations" as defined in this Section.

3. Requirements for periodic special inspection:
 - a. Verify items listed in the following paragraphs for conformance to the requirements of the Contract Documents and the Evaluation Report for the anchor being used. Observe the initial installation of each type and size of anchor, and subsequent installation of the same anchor at intervals of not more than 4 hours.
 - 1) Any change in the anchors used, in the personnel performing the installation, or in procedures used to install a given type of anchor shall require a new "initial inspection."
 - b. Substrate: Concrete or masonry surfaces receiving the anchor are sound and of a condition that will develop the anchor's rated strength.
 - c. Anchor:
 - 1) Manufacturer, type, and dimensions (diameter and length).
 - 2) Material (galvanized, Type 304 stainless steel, or Type 316 stainless steel).
 - d. Hole:
 - 1) Positioning: Spacing and edge distances.
 - 2) Drill bit type and diameter.
 - 3) Diameter, and depth.
 - 4) Hole cleaned in accordance with manufacturer's required procedures. Confirm multiple repetitions of cleaning when recommended by the manufacturer.
 - 5) Anchor's minimum effective embedment.
 - 6) Anchor tightening/installation torque.
 4. Requirements for continuous special inspection:
 - a. The special inspector shall observe all aspects of anchor installation, except that holes may be drilled in his/her absence provided that he/she confirms the use of acceptable drill bits before drilling, and later confirms the diameter, depth, and cleaning of drilled holes.
- E. Field tests:
1. Owner's Representative may, at any time, request testing to confirm that materials being delivered and installed conform to the requirements of the Specifications.
 - a. If such additional testing shows that the materials do not conform to the specified requirements, the Contractor shall pay the costs of these tests.
 - b. If such additional testing shows that the materials do conform to the specified requirements, the Owner shall pay the costs of these tests.

3.08 NON-CONFORMING WORK

- A. Remove misaligned or non-performing anchors.
- B. Fill empty anchor holes and repair failed anchor locations as required.
- C. If more than 10 percent of all tested anchors of a given diameter and type fail to achieve their specified torque or proof load, the Engineer will provide directions for required modifications. Make such modifications, up to and including replacement of all anchors, at no additional cost to the Owner.

3.09 SCHEDULES

- A. Stainless steel. Provide and install stainless steel anchors at the following locations:
1. "Corrosive locations" as defined in this Section: Type 316 stainless steel.
 2. "Wet and moist locations" as defined in this Section: Type 316 stainless steel.
 3. "Other locations:"
 - a. For connecting stainless steel] members to concrete or masonry: Type 304 stainless steel.]
 4. At locations indicated on the Drawings.
- B. Galvanized: Provide and install galvanized carbon steel anchors at the following locations:
1. Locations not requiring stainless steel.
 2. At locations indicated on the Drawings.
- C. Provide and install anchor materials as scheduled in the following Table.

Table - Required Anchoring Materials by Location			
Location/Exposure		Materials	Notes
1.	Anchors into concrete and grouted masonry for attachment of carbon steel, including structural steel and other steel fabrications:		
a)	Interior dry areas	Carbon steel - galvanized	
b)	Locations with galvanized steel structures or fabrications	Stainless steel - Type 304 or 316	1
c)	Exterior and interior wet and moist locations	Stainless steel - Type 316	1
d)	Corrosive locations	Stainless steel - Type 316	1
2.	Anchors into concrete and grouted masonry for attachment of aluminum, stainless steel, or fiber-reinforced plastic (FRP) shapes and fabrications:		
a)	Interior dry areas	Stainless steel - Type 304 or 316	1
b)	Exterior and interior wet and moist locations	Stainless steel - Type 316	1
c)	Corrosive locations	Stainless steel - Type 316	1
3.	Anchors for attaching equipment and its appurtenances:		
a)	All locations	Stainless steel - Type 316 (unless Type 304 is specifically indicated in the specifications for the equipment.)	1
Notes:			
(1) Where anchors are in contact with a metal that differs from that of the anchor, provide isolation sleeves and washers.			

END OF SECTION

SECTION 05500
METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
1. Aluminum grating stair tread.
 2. Aluminum stair nosing.
 3. Cast iron stop plank grooves.
 4. Concrete inserts.
 5. Handrails and guardrails.
 6. Ladders.
 7. Manhole frames and covers.
 8. Metal gratings.
 9. Metal tread plate.
 10. Preformed channel pipe supports.
 11. Stairs.
 12. Miscellaneous metals.
 13. Associated accessories to the above items.

1.02 REFERENCES

- A. Aluminum Association (AA):
1. DAF-45: Designations from Start to Finish.
 - a. M12-C22-A41.
- B. American Association of State Highway and Transportation Officials (AASHTO):
1. Standard Specifications for Highway Bridges.
- C. ASTM International (ASTM):
1. A36 - Standard Specification for Carbon Structural Steel.
 2. A48 - Standard Specification for Gray Iron Castings.
 3. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded, and Seamless.
 4. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 5. A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels for General Applications.
 6. A276 - Standard Specification for Stainless Steel Bars and Shapes.
 7. A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 8. A380 - Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
 9. A489 - Standard Specification for Carbon Steel Lifting Eyes.
 10. A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

11. A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 12. A635 - Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
 13. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 14. A992 - Standard Specification for Structural Steel Shapes.
 15. B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 16. B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 17. B308 - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
 18. B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 19. F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
 20. F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength.
- D. American Welding Society (AWS):
1. A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- E. National Association of Architectural Metal Manufacturers (NAAMM):
1. Metal Finishes Manual.
- F. Occupational Safety and Health Administration (OSHA).

1.03 DEFINITIONS

- A. Passivation: Removal of exogenous iron or iron compounds from the surface of a stainless steel by means of chemical dissolution resulting from treatment with an acid solution that removes the surface contamination but does not significantly affect the stainless steel itself.

1.04 SUBMITTALS

- A. Product Data:
1. Aluminum grating stair tread.
 2. Aluminum stair nosing.
 3. Cast iron stop plank grooves.
 4. Handrails and guardrails.
 5. Manhole frames and covers.
 6. Metal grating.
- B. Shop drawings:
1. Handrails and guardrails:
 - a. Including details on connection attachments, gates, kick plates, ladders, and angles.

- b. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - c. Include erection drawings, elevations, and details where applicable.
 - d. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
2. Ladders.
 3. Metal grating.
 4. Metal tread plate.
 5. Stairs.
 6. Miscellaneous metals.
- C. Samples:
1. Guardrails with specified finishes.
- D. Quality control submittals:
1. Design data.
 2. Test reports:
 - a. Guardrails: 3 copies of certified tests performed by an independent testing laboratory certifying that guardrails meet current State and OSHA strength requirements.
 - b. Gratings:
 - 1) Grating manufacturers' calculations showing that gratings will meet specified design load, stress, and deflection requirements for each size grating for each span.
 - 2) Reports of tests performed.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Unless otherwise specified or indicated on the Drawings, structural and miscellaneous metals in accordance with the standards of the ASTM, including the following:

Item	ASTM Standard No.	Class, Grade Type or Alloy No.
Cast Iron		
Cast Iron	A48	Class 40B
Steel		
Galvanized sheet iron or steel	A653	Coating G90
Coil (plate)	A635	--
Structural plate, bars, rolled shapes, and miscellaneous items (except W shapes).	A36	--
Rolled W shapes	A992	Grade 50
Standard bolts, nuts, and washers	A307	--

Item	ASTM Standard No.	Class, Grade Type or Alloy No.
High strength bolts, nuts, and hardened flat washers	F3125, Grade A325	--
Eyebolts	A489	Type 1
Tubing, cold-formed	A500	--
Tubing, hot-formed	A501	--
Steel pipe	A53	Grade B
Stainless Steel		
Plate, sheet, and strip	A240	Type 304* or 316**
Bars and shapes	A276	Type 304* or 316**
Bolts (Type 304)	F593	Group 1 Condition CW
Bolts (Type 316)	F593	Group 2 Condition CW
Aluminum		
Flashing sheet aluminum	B209	Alloy 5005-H14, 0.032 inches minimum thickness
Structural sheet aluminum-	B209	Alloy 6061-T6
Structural aluminum	B209 B308	Alloy 6061-T6
Extruded aluminum	B221	Alloy 6063-T42
* Use Type 304L if material will be welded.		
** Use Type 316L if material will be welded.		

1. Stainless steels are designated by type or series defined by ASTM.
2. Where stainless steel is welded, use low-carbon stainless steel.

2.02 MANUFACTURED UNITS

- A. Aluminum grating stair tread:
 1. Manufacturers: One of the following or equal:
 - a. Harsco Industrial IKG, Aluminum Grating Stair Tread with Mebac® nosing.
 - b. McNichols Co., Type A-Standard with Corrugated Angle Nosing.
 2. Material: Welded aluminum grating tread with non-slip nosing and integral end plates for bolt on attachment to stair stringers.
 3. Size:
 - a. Tread width: To equal tread spacing plus 1 inch minimum.
 - b. Tread length: Length to suit stringer-to-stringer dimension on the Drawings.
 - c. Depth: 1-3/4 inches.
 4. Bolts: Type 316 stainless steel.

- B. Aluminum stair nosing:
 - 1. Manufacturers: One of the following or equal:
 - a. Wooster Products, Inc., Type 101 Nosing.
 - b. American Safety Tread Co., Inc., Style 801 Nosing.
 - 2. Material: Cast aluminum abrasive nosings with aluminum oxide granules integrally cast into metal, forming permanent, nonslip, long-wearing surface.
 - 3. For installation in cast-in-place stairs.
 - 4. Configuration: 4 inches wide, fabricated with integrally cast stainless steel anchors at approximately 12-inch centers. Length to extend within 3 inches of stair edge on each side.

- C. Cast iron stop plank grooves:
 - 1. Manufacturers: One of the following or equal:
 - a. Neenah Foundry Co., R-7500 Series, Type A.
 - b. McKinley Iron Works, Type L.
 - 2. Size: 2-inch wide groove opening by 1-1/2 inch deep, unless otherwise indicated on the Drawings.
 - 3. Recess groove with the cast iron surface of the groove set flush with the concrete surface.

- D. Concrete inserts:
 - 1. Concrete inserts for supporting pipe and other applications are specified in Section 15061 - Pipe Supports.

- E. Handrails and guardrails:
 - 1. General:
 - a. Design and fabricate assemblies to conform to current local, State, and OSHA standards and requirements.
 - b. Coordinate layout of assemblies and post spacings to avoid conflicts with equipment and equipment operators:
 - 1) Indicate on the shop drawings locations of such equipment.
 - 2) Highlight locations where railings cannot be made continuous, and obtain Engineer's directions on how to proceed before fabricating or installing railings.
 - 2. Aluminum handrails and guardrails (nonwelded pipe):
 - a. Rails, posts, and fitting-assembly spacers:
 - 1) In accordance with ASTM B429, 6005, 6063 or 6105, minimum Schedule 40, extruded aluminum pipe of minimum 1.89-inch outside diameter and 0.14-inch wall thickness.
 - b. Kick plates: 6061 or 6105 aluminum alloy.
 - c. Fastenings and fasteners: As recommended or furnished by the manufacturer.
 - d. Other parts: 6063 extruded aluminum, or F214 or F514.0 aluminum castings:
 - 1) Fabrications: In accordance with ASTM B209 or ASTM B221 extruded bars:
 - a) Bases: 6061 or 6063 extruded aluminum alloy.
 - 2) Plug screws or blind rivets: Type 305 stainless steel.
 - a) Other parts: Type 300 series stainless steel.

- e. Finish of aluminum components:
 - 1) Anodized finish, 0.7 mil thick, applied to exposed surfaces after cutting. Aluminum Association Specification M12-C22-A41, mechanical finish non specular as fabricated, chemical finish-medium matte, anodic coating-clear Class I Architectural.
 - 2) Pretreat aluminum for cleaning and removing markings before anodizing.
 - f. Fabrication and assembly:
 - 1) Fabricate posts in single, unspliced pipe length.
 - 2) Perform without welding.
 - 3) Do not epoxy bond the parts.
 - 4) Maximum clear opening between assembled railing components as indicated on the Drawings.
 - g. Manufacturers: One of the following or equal:
 - 1) Moultrie Manufacturing Co., Wesrail.
 - 2) Golden Railings, Riveted System.
 - 3) Craneveyor Corp. Enerco Metals, C-V Rail.
 - 3. Steel pipe handrails and guardrails:
 - a. Schedule 40 black steel pipe with minimum 1.9-inch outside diameter, or larger where indicated on the Drawings.
 - b. Fabricate posts in single, unspliced pipe length.
 - c. Kick plates: Galvanized steel.
 - d. Attachment devices: Provide clip angles and other fasteners necessary for securing handrails and guardrails to other construction as indicated on the Drawings.
 - e. Continuously weld joints and grind smooth.
 - f. Bend rails to profile indicated on the Drawings, without sharp bends or flat spots. Rails shall be round after bending.
 - g. Neatly weld intersection of rails and posts, and grind surfaces smooth.
 - 4. Fastenings and fasteners: As recommended or furnished by guardrail manufacturer for use with this system.
- F. Ladders:
- 1. General:
 - a. Type: Safety type conforming to local, State, and OSHA standards as minimum. Furnish guards for ladder wells.
 - b. Size: 18 inches wide between side rails of length, size, shape, detail, and location indicated on the Drawings.
 - 2. Aluminum ladders:
 - a. Materials: 6063-T5 aluminum alloy.
 - b. Rungs:
 - 1) 1-inch minimum solid square bar with 1/8-inch grooves in top and deeply serrated on all sides.
 - 2) Capable of withstanding 1,000 pound load without failure.
 - c. Side rails: Minimum 4-inch by 1/2-inch flat bars.
 - d. Finish of aluminum components:
 - 1) Anodized finish, 0.7 mil thick, applied to exposed surfaces after cutting. Aluminum Association Specification M12-C22-A41,

- mechanical finish non specular as fabricated, chemical finish-medium matte, anodic coating-clear Class I Architectural.
- 2) Pretreat aluminum for cleaning and removing markings before anodizing.
- e. Fabrication:
- 1) Welded construction, of size, shape, location, and details indicated on the Drawings.
 - 2) For ladders over 20 feet high, furnish standard ladder cages or fall prevention system designed in accordance with State and OSHA requirements.
- f. Fall prevention system: Include but not limit to railing, brackets, clamps, 2 sleeves, and 2 belts, satisfying OSHA safe climbing requirements:
- 1) Manufacturers: One of the following or equal:
 - a) North Consumer Products, Saf-T-Climb.
 - b) Swager Communications, Climbers Buddy System.
- G. Manhole frames and covers:
1. Material: Gray iron castings, in accordance with ASTM A48, Class 30-B.
 2. Type: Heavy-duty traffic type, with combined minimum set weight of 265 pounds.
 3. Machine horizontal and vertical bearing surfaces to fit neatly, with easily removable cover bearing firmly in frame without rocking.
 4. Frame:
 - a. Bottom flange type.
 - b. Approximately 4-1/2 inches frame height.
 - c. Dimensions as indicated on the Drawings.
 - 1) Minimum inside clear dimension may not be smaller than nominal diameter minus 2 inches.
 5. Cover:
 - a. Skid-resistant grid pattern design stamped with name of utility service provided by manhole, such as "ELECTRICAL," "SEWER," "TELEPHONE," or "WATER."
 - b. Solid type without ventilation holes.
 6. Finish: Unpainted.
- H. Metal gratings:
1. General:
 - a. Fabricate grating to cover areas indicated on the Drawings.
 - b. Unless otherwise indicated on the Drawings, grating over an opening shall cover entire opening.
 - c. Make cutouts in grating where required for equipment access or protrusion, including valve operators or stems, and gate frames.
 - d. Band ends of grating and edges of cutouts in grating:
 - 1) End banding: 1/4 inch less than height of grating, with top of grating and top edge of banding flush.
 - 2) Cutout banding: Full-height of grating.
 - 3) Use banding of same material as grating.
 - 4) Panel layout: Enable installation and subsequent removal of grating around protrusions or piping.
 - 5) Openings 6 inches and larger: Lay out grating panels with edges of 2 adjacent panels located on centerline of opening.

- 6) Openings smaller than 6 inches: Locate opening at edge of single panel.
 - 7) Where an area requires more than 1 grating section to cover area, clamp adjacent grating sections together at 1/4-points with fasteners acceptable to Engineer.
 - 8) Fabricate steel grating sections in units weighing not more than 50 pounds each.
 - 9) Fabricate aluminum grating sections in units of weighing not more than 50 pounds each.
 - 10) Gaps between adjacent grating sections shall not be more than the clear spacing between bearing bars.
 - e. When requested by Engineer, test 1 section of each size grating for each span length involved on the job under full load:
 - 1) Furnish a suitable dial gauge for measuring deflections.
 - f. Grating shall be aluminum, unless otherwise specified or indicated on the Drawings.
2. Aluminum grating:
- a. Material for gratings, shelf angles, and rebates: 6061-T6 or 6063-T6 aluminum alloy, except crossbars may be 6063-T5 aluminum alloy.
 - b. Shelf angle concrete anchors: Type 304 or Type 316 stainless steel.
 - c. Grating rebate rod anchors: 6061-T6 or 6063-T6 aluminum alloy.
 - d. Bar size and spacing: As determined by manufacturer to enable grating to support design load.
 - e. Design live load: A minimum of 100 pounds per square foot uniform live load on entire grating area, but not less than the live load indicated on the Drawings for the area where grating is located.
 - f. Maximum fiber stress for design load: 12,000 pounds per square inch.
 - g. Maximum deflection due to design load: 1/240 of grating clear span.
 - h. Maximum spacing of main grating bars: 1-1/8 inches clear between bars.
 - i. Minimum grating height: 1-1/2 inches.
 - j. Manufacturers: The following or equal:
 - 1) Harsco Industrial IKG, Swaged Aluminum I-Bar with striated finish.
3. Steel gratings:
- a. Hot-dip galvanized in accordance with ASTM A123.
 - b. Bar size and spacing: As determined by the manufacturer to support design load.
 - c. Design live load: A minimum of 100 pounds per square foot uniform live load on the entire area of the grating area, but not less than the live load indicated on the Drawings for the area where the grating is located.
 - d. Maximum fiber stress for design load: 18,000 pounds per square inch.
 - e. Maximum deflection under design load: 1/240 of grating clear span.
 - f. Bar spacing: Maximum of 1-1/8 inches clear between bars.
 - g. Manufacturers: The following or equal:
 - 1) Harsco Industrial IKG, IKG Weldforged.
4. Heavy-duty steel grating:
- a. Heavy-duty type, fabricated from structural steel and designed in accordance with AASHTO Standard Specifications for Highway Bridges, using H-20 loading.
 - b. Hot-dip galvanized after fabrication in accordance with ASTM A123.

- c. Manufacturers: One of the following or equal:
 - 1) Reliance Steel Products Co., Heavy-Duty Steel Grating.
 - 2) Seidelhuber Metal Products, Inc., equivalent product.

- I. Metal tread plate:
 - 1. Plate having a raised figured pattern on 1 surface to provide improved traction.

- J. Miscellaneous aluminum:
 - 1. Fabricate aluminum products, not covered separately in this Section, in accordance with the best practices of the trade and field assemble by riveting or bolting.
 - 2. Do not weld or flame cut.

- K. Miscellaneous cast iron:
 - 1. General:
 - a. Tough, gray iron, free from cracks, holes, swells, and cold shuts.
 - b. Quality such that hammer blow will produce indentation on rectangular edge of casting without flaking metal.
 - c. Before leaving the foundry, clean castings and apply 16-mil dry film thickness coating of coal-tar epoxy, unless otherwise specified or indicated on the Drawings.

- L. Miscellaneous stainless steel:
 - 1. Provide miscellaneous stainless steel items not specified in this Section as indicated on the Drawings or specified elsewhere.
 - a. Fabricate and install in accordance with the best practices of the trade.
 - 2. Cleaning and passivation:
 - a. Following shop fabrication of stainless steel members, clean and passivate fabrications.
 - b. Finish requirements: Remove free iron, heat tint oxides, weld scale and other impurities, and obtain a passive finished surface.
 - c. Provide quality control testing to verify effectiveness of cleaning agents and procedures and to confirm that finished surfaces are clean and passivated.
 - 1) Conduct sample runs using test specimens with proposed cleaning agents and procedures as required to avoid adverse effects on surface finishes and base materials.
 - d. Pre-clean, chemically descale (pickle), and final clean fabrications in accordance with the requirements of ASTM A380 to remove deposited contaminants before shipping.
 - 1) Passivation by citric acid treatment is not allowed.
 - a) If degreasing is required before cleaning to remove scale or iron oxide, cleaning (pickling) treatments with citric acid are permissible; however, these treatments shall be followed by inorganic cleaners such as nitric-hydrofluoric acid.
 - 2) Provide acid descaling (pickling) in accordance with Table A1.1 of Annex A1 of ASTM A380.
 - 3) After pickling, final cleaning of stainless steel shall conform to Part II of Table A2.1 of Annex A2 of ASTM A380.

- e. After cleaning, inspect using methods specified for "gross inspection" in ASTM A380.
 - f. Improperly or poorly cleaned and passivated materials shall not be shipped and will not be accepted at the job site.
- M. Miscellaneous structural steel:
- 1. Provide miscellaneous steel items not specified in this Section as indicated on the Drawings or specified elsewhere.
 - a. Fabricate and install in accordance with the best practices of the trade.
- N. Isolating sleeves and washers:
- 1. As indicated on the Drawings and as specified in Section 05190 - Mechanical Anchoring and Fastening to Concrete and Masonry.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions:
- 1. Examine work in place to verify that it is satisfactory to receive the work of this Section.
 - 2. If unsatisfactory conditions exist, do not begin this work until such conditions have been corrected.

3.02 INSTALLATION

- A. General:
- 1. Install products as indicated on the Drawings, and in accordance with shop drawings and manufacturer's printed instructions, as applicable except where specified otherwise.
 - 2. Interface between materials:
 - a. Dissimilar metals: Where steel comes in contact with dissimilar metals (aluminum, stainless steel, etc.), separate or isolate the dissimilar metals.
 - 1) Make application so that the isolating or protective barrier is not visible in the completed construction.
 - 2) Isolating sleeves and washers: As specified in Section 05190 - Mechanical Anchoring and Fastening to Concrete and Masonry.
 - b. Aluminum in contact with concrete or masonry: Coat aluminum surfaces as specified in Section 09960 - High Performance Coatings.
 - c. Aluminum in contact with concrete or masonry.
- B. Handrails and guardrails:
- 1. General:
 - a. Fasten pipe rails to fittings with Series 300 stainless steel pop rivets or flush set screws.
 - b. Make pipe cuts clean and straight, free of burrs and nicks, and square and accurate for minimum joint-gap.
 - c. Drill and countersink holes to proper size, as required for a tight flush fit of screws and other component parts.

- d. Space attachment brackets as indicated in the manufacturer's instructions.
- 2. Aluminum pipe handrails and guardrails:
 - a. During construction, keep exterior surfaces of handrails and guardrails covered with minimum 0.4 millimeters of heat shrink polyethylene film.
 - b. Do not remove protective film before handrails and guardrails have been accepted by Engineer nor before other work in proximity of handrails and guardrails has been completed.
 - c. Discontinue handrails and guardrails at lighting fixtures.
 - d. Provide 1/8-inch diameter weep hole at base of each post.
 - e. Space posts as indicated on the Drawings.
 - f. Anchor posts into concrete by grouting posts into formed holes in concrete, into stainless steel sleeves cast in concrete; or bracket mount to face of concrete surfaces as specified and indicated on the Drawings.
 - g. Space rails as indicated on the Drawings.
 - h. Make adequate provision for expansion and contraction of kick plates and rails.
 - 1) Make provisions for removable sections where indicated on the Drawings.
 - i. Make lower rails a single, unspliced length between posts, or continuous.
 - j. Make top rails continuous whenever possible, and attach single, unspliced lengths to 3 posts minimum.
 - k. Draw up fasteners tight with hand wrench or screw driver.
 - l. Space attachment brackets as indicated on shop drawings or in manufacturer's installation instructions.
 - m. Completed installation shall have handrails and railings rigid and free of play at joints and attachments.
 - n. Protect handrail and guardrail finish from scratches, gouges, dents, stains, and other damage.
 - o. Replace damaged or disfigured handrails and guardrails with new.
 - p. Shortly before final acceptance of the work, and after removal of protective polyethylene film, clean handrails and guardrails with mild detergent or with soap and water.
 - 1) After cleaning, thoroughly rinse handrails and guardrails and wipe with soft cloth.
 - q. Erect guardrail straight, level, plumb, and true to the positions as indicated on the Drawings. Correct deviations from true line of grade, which are visible to the eye.
- 3. Steel pipe handrail and guardrail:
 - a. Anchor posts into concrete by grouting posts into galvanized steel sleeves embedded in concrete as indicated on the Drawings.
 - 1) Do not cut reinforcing bars in concrete.
 - 2) Where required to fasten guardrail to other construction, fasten as indicated on the Drawings.

C. Ladders:

- 1. Secure to supporting surface with bent plate clips providing minimum 8 inches between supporting surface and center of rungs.
- 2. Where exit from ladder is forward over top rung, extend side rails 3 feet 3 inches minimum above landing, and return the rails with a radius bend to the landing.

3. Where exit from ladder is to side, extend ladder 5 feet 6 inches minimum above landing and rigidly secure at top.
 4. Erect rail straight, level, plumb, and true to position indicated on the Drawings:
 - a. Correct deviations from true line or grade which are visible to the eye.
- D. Manhole frames and covers:
1. Installation: As recommended by Manufacturer.
- E. Metal gratings:
1. General:
 - a. Allow 1/8-inch maximum clearance between ends of grating and inside face of vertical leg of shelf angles.
 - b. Horizontal bearing leg of shelf angles shall be 2 inches minimum.
 - c. Install aluminum plate or angles where necessary to fill openings at changes in elevation and at openings between equipment and grating.
 - d. Install angle stops at ends of grating.
 - e. Installed grating shall not slide out of rebate or off support.
 - f. Weld stops in place, unless otherwise specified or indicated on the Drawings.
 - g. Top surfaces of grating sections adjacent to each other shall lie in same plane.
 2. Aluminum grating:
 - a. Aluminum grating: Support on aluminum shelf angles or rebates.
 3. Steel grating:
 - a. Support on hot-dip galvanized structural steel shelf angles or rebates.
 4. Heavy-duty steel grating:
 - a. Support on hot-dip galvanized structural steel rebates embedded and anchored in concrete.
 - b. Use for roadways, traffic areas, and where indicated on the Drawings.
- F. Stainless Steel:
1. Welding:
 - a. Passivate field-welded surfaces:
 - 1) Provide cleaning, pickling and passivating as specified in this Section.
 - 2) Clean using Derustit Stainless Steel Cleaner, or equal.

END OF SECTION