

BID NO. 24-35

CITY OF KILLEEN, TEXAS



AIRPORT PUMP STATION UPDATE

JULY 2023

ENGINEERING DEPARTMENT

**CITY OF KILLEEN
BELL COUNTY, TEXAS**

*KSA Engineers, Inc.
4833 Spicewood Springs Rd.
Suite 204
Austin, Texas 78759
(512)342-6868*

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CITY OF KILLEEN, TEXAS

CITY OFFICIALS:

MAYOR

Debbie Nash-King

COUNCIL MEMBERS

Jose L. Segarra

Ramon Alvarez

Jessica Gonzalez

Riakos Adams,

Nina Cobb

Michael Boyd

Joseph Solomon

CITY MANAGER

Kent Cagle

CITY ENGINEER

Andrew Zagars, P.E.

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NOTICE TO BIDDERS
BID NO. 24-35
Airport Pump Station Update
CITY OF KILLEEN, TEXAS

Notice is hereby given that the City of Killeen will receive sealed bids for Airport Pump Station Update electronically through the City's OpenGov e-bidding site *or* addressed to the City of Killeen, Attn: Purchasing Division, 802 N. 2nd Street, Building E, 2nd Floor, Killeen, Texas 76541, until **2:00 p.m. on May 2, 2024**. Submittals received after the closing time will be returned unopened. Vendors may register and submit bids electronically at <https://procurement.opengov.com/login>.

Bids will be opened and read aloud through Zoom online video conferencing at **2:15 p.m. on May 2, 2024**; Zoom access is shown below. The general public will not be allowed inside the facility.

Zoom access:

For viewing follow;

<https://us06web.zoom.us/j/3397887656?pwd=Z0VWU1czOGRpQ245enJWS1hCSnJJUT09>

Call: 1-346-248-7799

Meeting ID: 339 788 7656

Password: **04142020**

A pre-bid conference and site visit will be held on April 23, 2024 at 2:00 PM at Water & Sewer Conference Room, 805 West Jasper Drive, Killeen, TX 76542. Attendance is *mandatory*.

Bid questions will be accepted on the OpenGov e-bidding site, until **2:00 p.m. on April 25, 2024**. Questions will be answered in the form of an addendum and posted on the OpenGov website. It is the bidders/proposer's responsibility to obtain and acknowledge all addendums.

Complete information regarding this solicitation may be obtained from the City of Killeen website (<https://www.killeentexas.gov/414/Purchasing>), Demand Star (<http://www.demandstar.com/>), and OpenGov E-Bidding site (<https://procurement.opengov.com/login>).

The City of Killeen reserves the right to reject any or all bids and waive any irregularities.

CITY OF KILLEEN, TEXAS

Lorianne Luciano
Director of Procurement and Contract Management

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INSTRUCTIONS TO BIDDERS

1. PREPARATION OF BIDS:

Submit BIDS upon the prescribed forms, or copies thereof. Prepare BIDS in compliance with the requirements of the NOTICE TO BIDDERS, these instructions, and the instructions printed on the prescribed forms. All applicable blank spaces on the BID must be filled in as noted, in ink with amounts extended and totaled, and no changes made in the phraseology of the forms or of the items mentioned therein. Any BID may be deemed irregular which contains any omission, erasure, alteration, addition, irregularity of any kind, or item not called for, or which does not contain prices set opposite to each of the several items in the BID form, or in which any of the prices are obviously unbalanced or which fails to conform in any manner to the conditions of the NOTICE TO BIDDERS. The bidder must sign his BID in the blank space provided therefore. If the BID is made by a partnership, it must be signed on behalf of the partnership by one of the partners; if made by a corporation, it must be signed on behalf of the corporation by one of its officers. In order to ensure consideration, the BID must be enclosed in a sealed envelope plainly identified by the name of the project and addressed to the Owner as prescribed in the NOTICE TO BIDDERS.

2. INTERPRETATION OF CONTRACT DOCUMENTS AND TECHNICAL SPECIFICATIONS, AND PLANS:

Bidders desiring further information, or further interpretation of the Contract Documents and TECHNICAL SPECIFICATIONS and PLANS must make request for such information to the Engineer, prior to 48 hours before the bid opening. Answers to all such requests will be given in writing to all bidders, in addendum form, and all addenda will be bound and made a part of the Contract. No other explanation or interpretation will be considered official or binding. Should a bidder find discrepancies in, or omissions from the Contract Documents, TECHNICAL SPECIFICATIONS, or PLANS, or should he be in doubt as to their meanings, he should at once notify the Engineer in order that a written addendum may be sent to all bidders. It is the responsibility of the bidders to know if they received all such addenda, complete files of which will be maintained in the office of the Engineer and in the Office designated to receive the BIDS.

3. AWARD OF CONTRACT

Unless he rejects all BIDS, the Owner will award the Contract within sixty (60) days of the bid date, unless the time is extended by mutual consent. Considering all elements of the BIDS, contract will be awarded to the lowest responsible bidder. The right is reserved to reject any or all BIDS and to waive technical defects, as the interest of the Owner may require.

4. CONDITIONS OF WORK:

Each bidder is expected to inform himself fully of the construction and labor conditions under which the work will be performed, and will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Contract Documents, TECHNICAL SPECIFICATIONS, and PLANS. Failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of the Contract and to complete the contemplated work for the considerations set forth in this BID. Any information given in regard to subsurface data, test borings, and similar conditions are to be considered approximate and does not relieve the bidder of the responsibility for its verification.

5. TIME OF COMPLETION:

The Contractor shall have 360 consecutive calendar days to complete the proposed work. Liquidated damages in the amount of \$1,000 shall be assessed each day thereafter.

6. DELIVERY OF PROPOSALS:

It is the bidder's responsibility to deliver his BID at the proper time to the proper place. The fact that a BID was dispatched will not be considered. The bidder must have the BID actually delivered.

7. SITE INVESTIGATION:

The Bidder acknowledges that he has satisfied himself as to the nature and location of the Work, the general and local conditions, including, but not limited to, those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads, and uncertainties of weather, river stages, or similar physical conditions of the site, the conformation and facilities needed preliminary to and during prosecution of the Work.

8. QUALIFICATION OF BIDDERS:

The Owner may make such investigations as he deems necessary to determine the ability of the Bidder to perform the Work. The Bidder shall furnish all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the Bidder is not properly qualified to carry out the obligations of the Contract. Conditional bids will NOT be accepted.

**CITY OF KILLEEN
GENERAL TERMS AND CONDITIONS**

1. General Conditions

Bidders are required to submit their Bid upon the following express conditions:

- (a) Bidders shall make all investigation necessary to thoroughly inform themselves regarding plant and facilities for delivery of material and equipment as required by the Bid conditions. No plea of ignorance by the bidder of conditions that exist or that may hereafter exist as a result of failure or omission on the part of the bidder to make the necessary examinations and investigations, or failure to fulfill in every detail the requirements of the contract documents, will be accepted as a basis for varying the requirements of the City or the compensation to the bidder.
- (b) Unless specifically stated otherwise in the specifications, only new products or equipment will be acceptable.

2. Preparation of Bid

Bid will be prepared in accordance with the following:

- (a) All information required by the Bid shall be furnished. The bidder shall print or type his/her name and manually or electronically sign the Bid and each continuation sheet on which an entry is made.
- (b) Unit prices shall be shown and where there is an error in extension of the price, the unit price shall govern.
- (c) Alternate Bids will not be considered unless authorized by the City within the specifications.
- (d) Proposed delivery time must be shown and shall include weekends and holidays if requested by the City.
- (e) The City qualifies for exemption from State and Local Sales and Use Taxes pursuant to the provision of Article 20.04(f) of the Texas Limited Sales, Excise and Use Tax Act. Taxes normally levied on the purchase, rental and lease of materials, supplies and equipment used or consumed in performance of the Contract may be exempted by issuing to suppliers an exemption certificate in lieu of tax. Exemption certificates comply with State Comptroller of Public Accounts Ruling No. 95-0.07. Any such exemption certificate issued in lieu of tax shall be subject to State Comptroller of Public Accounts Ruling No. 95-0.09, as amended. Failure by the Bidder or the bidder's Subcontractors to take advantage of the City's exemption and to obtain such exemption certificate shall make him responsible for paying taxes incurred on materials furnished on the Project without additional cost to or reimbursement by the City.

3. Description of Supplies

Any catalog of manufacturer's reference used in describing an item is merely descriptive, and not restrictive, unless otherwise noted, and is used only to indicate type and quality of material. Bidders are required to state exactly what they intend to furnish; otherwise, they will be required to furnish the item as specified.

4. Submission of Bid

By submitting your Bid, you acknowledge that the City of Killeen will not accept any Bid, or execute any submitted contract in conjunction with a Bid that requires the City to agree to any of the following:

- Governing law other than the law of the State of Texas
- Venue other than Bell County
- Mandatory arbitration
- Artificial limitation of liability

- Artificial statute of limitation
 - Waiver of trial by jury
 - Indemnify a vendor
- (a) Bid and changes thereto shall be enclosed in a sealed envelope addressed to the Purchasing Office, City of Killeen. The names and address of Bidder, the date and hour of the Bid opening and the Bid number shall be placed on the outside of the envelope.
- (b) Bids must be submitted on the forms furnished. Telegraphic Bids will not be considered. However, Bids may be modified by written notice provided such notice is received prior to the time and date set for the Bid opening.
- (c) All Bid documents shall be sealed and submitted no later than the specified date and hour of the Bid opening to:

Electronically submit bids to OpenGov E-Bidding Site: (<https://procurement.opengov.com/login>)

OR

Delivery Address:
City of Killeen
Attn: Purchasing Division
802 N 2nd Street
Building E, 2nd Floor
Killeen, TX 76541

5. Rejection of Bid

- (a) The City may reject a Bid if:
1. The Bidder mistakes or conceals any material fact in the Bid, or if
 2. The Bid does not strictly conform to law or the requirements of the Bid, or if
 3. The Bid is conditional, except that the Bidder may qualify his Bid for acceptance by the City as an "All or None" basis.
- (b) The City may, however, reject all Bids whenever it is deemed in the best interest of the City to do so, and may reject any part of a Bid unless the Bid has been qualified as provided in section 5(a) 3 above.

6. Withdrawal of Bid

A bidder may withdraw a bid that has been submitted at any time up to the due date and time. To accomplish this, a written request signed by an authorized representative of the bidder must be submitted to the Director of Procurement and Contract Management at LLuciano@KilleenTexas.gov. All bids shall be valid for a period of ninety (90) days after the bid opening

7. Late Bid or Modifications

Bid and modifications received after the time set for the Bid opening will not be considered.

8. Clarification or Objection to Bid Specifications

If any person contemplating submitting a Bid for this contract is in doubt as to the true meaning of the specifications, or other Bid documents, or any part thereof, he may submit to Purchasing, a request for clarification by the deadline established in the Bid. All such requests for information shall be made in writing and the person submitting the

request will be responsible for its prompt delivery. Any interpretation of the Bid, if made, will be made only by an addendum duly issued. A copy of such addendum will be distributed to all known bidders who have expressed an interest in this bid. The City will not be responsible for any other explanation or interpretation of the proposed Bid made or given prior to the award of the contract. Any objection to the specifications and requirements, as set forth in the Bid documents must be filed in writing with the Purchasing Division by the deadline established in the Bid.

9. Discounts

- (a) Prompt payment discounts will be considered in making the award provided the period of the discount offered is sufficient to permit payment within such period in the regular course of business.
- (b) In connection with any discount offered, time will be computed from the date of receipt of supplies or services or from the date a correct invoice is received, whichever is the later date. Payment is deemed to be made on the date of mailing of the check.

10. Award of the Contract

- (a) The contract will be awarded to the lowest responsible bidder. "Lowest responsible bidder" means the Bidder submitting the lowest bid meeting all requirements of the specifications, instructions, and terms and conditions of the bid and who has the financial and practical ability to perform all obligations of the Contract fully and reliably, taking into consideration qualifications and past performance of the Bidder. The following are considered examples of performance that is not responsible and may lead to a determination that the Bidder is not responsible:
 - * Falsification of information provided in bid response;
 - * Non-observance of safety requirements;
 - * Failure to meet requirements of federal, state, or local law, as applicable, including employment;
 - * Substantial failure to adhere to contractually agreed-upon schedules; and
 - * Poor past performance on City projects such as use of defective materials, refusal to correct defective work not in accordance with contract documents, failure to reasonably resolve disputes, termination for cause, or performance leading to litigation.

Determination of most advantageous Bid for the municipality may be based on, but not limited to:

* Unit price * Total Bid price * Terms and discounts * Delivery date * Product warranty * Special needs and requirements of City * Past experience with product/service * City's evaluation of the bidder's ability, financial, strength, and ethical standards * Quality of the bidder's goods or services * The extent to which the goods or services meet the municipality's needs	* Bidder's past performance * Demurrage charges, freight costs and mileage * Estimated costs of supplies, maintenance, etc. * Estimated surplus value, life expectancy * Results of testing samples * Conformity to specifications * Training requirements, location, etc. * Location of maintenance facility/service person; ability to provide for minimum down time * The total long-term cost to the municipality to acquire the bidder's goods or services * Reputation of bidder and of bidder goods and services
- (b) The City reserves the right to accept any item or group of items of this Bid, unless the Bidder qualifies his Bid by specific limitation. Reference section 5(a) 3 above.
 - (c) A written award of acceptance mailed or otherwise furnished to the successful Bidder(s) will then be followed up with a contract/service agreement for review by the City's legal team, if not otherwise specified within.

- (d) Prices must be quoted "F.O.B. Destination (Killeen) with all transportation charges prepaid," unless otherwise specified in the Bid.
- (e) If identical Bids are received from two or more bidders and those Bids are the lowest and best Bid, the tie shall be broken in accordance with provisions in Chapter 271 of the Texas Local Government Code.
- (f) As stated in Section 271.905 (b) of the Texas Local Government Code, "In purchasing under this title any real property or personal property that is not affixed to real property, if a local government receives one or more competitive sealed Bids from a bidder whose principal place of business is in the local government and whose Bid is within three percent of the lowest Bid price received by the local government from a bidder who is not a resident of the municipality, the local government may enter into a contract with: (1) the lowest bidder; or (2) the bidder whose principal place of business is in the local government if the governing body of the local government determines, in writing, that the local bidder offers the local government the best combination of contract price and additional economic development opportunities for the local government created by the contract award, including the employment of residents of the local government and increased tax revenues to the local government."
- (g) As stated in Section 271.9051 (b) of the Texas Local Government Code, "In purchasing real property or personal property that is not affixed to real property, or services, if a municipality receives one or more competitive sealed Bids from a bidder whose principal place of business is in the municipality and whose Bid is within five percent of the lowest Bid price received by the municipality from a bidder who is not a resident of the municipality, the municipality may enter into a contract for an expenditure of less than \$100,000 or a contract for other purchases in an amount of less than \$500,000 with: (1) the lowest bidder; or (2) the bidder whose principal place of business is in the municipality if the governing body of the local government determines, in writing, that the local bidder offers the municipality the best combination of contract price and additional economic development opportunities for the municipality created by the contract award, including the employment of residents of the municipality and increased tax revenues to the municipality."

11. Ex Parte Communication

Please note that to ensure the proper and fair evaluation of a proposal, the City prohibits ex parte communication (e.g., unsolicited) initiated by the Proposer to a City Official or employee evaluating or considering the proposal prior to the time a formal decision has been made. Questions and other communication from proposers will be permissible with only the Director of Procurement and Contract Management until the time and the day specified as the deadline for questions. Any communication between Proposer and the City after the deadline for questions will be initiated by the appropriate City Official or employee in order to obtain information or clarification needed to develop a proper and accurate evaluation of the proposals. Participation in any ex parte communication, whether or not initiated by the Proposer, may be grounds for disqualifying the offending proposer from consideration or award of the solicitation then in evaluation, or any future solicitation.

Additionally, neither the City of Killeen City Council nor City staff, except in the course of City-Sponsored inquiries, briefings, interviews, or presentations, shall initiate any contact with a Proposer or directly discuss or promote any proposal with any Proposers, including their agents and representatives.

12. Bid Protest

Any bidder wishing to file a protest concerning alleged improprieties with this solicitation must submit the protest in written format to the Purchasing Division within 5 business days after the specified time of the Bid opening. The formal written protest must identify the name of the bidder contesting the solicitation, the project name and number, and the specific grounds for the protest with all supporting documentation. A response to the protest will be prepared by Purchasing within 10 business days of receipt of the protest. All determinations made by the City are final.

13. Termination for Governmental Non-Appropriations

This contract is a commitment of the City's current revenues only. Should the terms of the Bid require payment of funds over more than the current fiscal year ending September 30, the following shall apply:

- (a) For each lease, City represents and warrants: that it has appropriated and budgeted the necessary fund to make all rent payments required pursuant to such lease for the remainder of the fiscal year in which the payment term commences; and that it currently intends to make rent payments for the full lease term as scheduled in the applicable payment schedule if funds are appropriated for the rent payment in each succeeding fiscal year by its governing body. Without contractually committing itself to do so, City reasonably believes that monies in an amount sufficient to make all rent payments can and will lawfully be appropriated; therefore, City agrees to budget requests to include the rent payments payable during each fiscal year in the budget requests presented to City's governing body for each fiscal year; provided, that City's governing body retains authority to approve or reject any such budget request. All rent payments shall be payable out of the general funds of the City or out of other funds legally appropriated, therefore. Lessor agrees that no lease will be a general obligation of the City and no lease shall constitute a pledge of either the full faith and credit of the City or the taxing power of the City.
- (b) If City's governing body fails to appropriate sufficient funds in any fiscal year for rent property or other payments due under a lease and if other funds are not legally appropriated for such payment, then a non-appropriation event shall be deemed to have occurred. If a non-appropriation event occurs, then: (1) the City shall give lessor immediate notice of such non-appropriation event and provide written evidence of such failure by the City's governing body; (2) on the return date, the City shall return to Lessor all of the equipment covered by the affected lease, at the City's sole expense; (3) the affected lease shall terminate on the return date without penalty to the City; (4) return date means the last day of the fiscal year for which appropriations were made for the rent payments due under a lease.

14. Termination of Contract

This contract shall remain in effect until the contract expires, delivery/completion and acceptance of products and/or performance of services ordered or until terminated by either party with a thirty (30) day written notice prior to any cancellation. All bidders must state therein the reasons for such cancellation. The City reserves the right to award a cancelled contract to next best offeror as it deems to be in the best interest of the City.

15. Assurance of Compliance

For Equal Employment Opportunity and Small and/or Minority Business Enterprise Requirements the bidder agrees that if this Bid is accepted, he/she will not engage in employment practices which have the effect of discriminating against employees or prospective employees because of race, color, religion, national origin, sex, age, handicap, or political belief or affiliation.

16. Conflict of Interest Disclosure Questionnaire

The Bidder agrees that if a member of the City Council, a Councilmember's close relative, or any officer or employee of the City has a financial interest, direct or indirect, or by reason of ownership of stock in any corporation, in any contract with the City, or be financially interested, directly or indirectly, in the sale to the City any land, materials, supplies or services except on behalf of the City, as an officer or employee, the official shall file before a vote or decision on any matter involving the business entity or the real property, an affidavit stating the nature and extent of the interest and shall abstain from further participation in the matter if:

- (a) in the case of a substantial interest in a business entity the action on the matter will have a special economic effect on the business entity that is distinguishable from the effect on the public; or
- (b) in the case of a substantial interest in real property, it is reasonably foreseeable that an action on the matter will have a special economic effect on the value of the property, distinguishable from its effect on the public.

Chapter 176 of the Texas Local Government Code mandates the public disclosure of certain information

concerning persons doing business or seeking to do business with the City of Killeen, including affiliations and business and financial relationships such persons may have with the City of Killeen. An explanation of the requirements of Chapter 176 and complete text of the new law are available at:
<https://www.ethics.state.tx.us/data/forms/conflict/CIQ.pdf>

17. Gratuities

It shall be a breach of ethics to offer, give, or agree to give any employee of the City or for any employee of the City to solicit or accept from another person, a gratuity, or an offer of employment in connection with any decision regarding any part of a program requirement, proposal, or purchase request pending before the City.

18. Kickbacks

It shall be a breach of ethics for any payment, gratuity, or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime contractor or higher tier subcontractor for any contract for the City, or any person associated therewith, as an inducement for the award of a subcontract or order.

19. Venue for Legal Action

This agreement shall be governed and construed according to the laws of the State of Texas. Venue for purposes of any and all lawsuits, causes of actions, claims or disputes shall be in Bell County, Texas.

20. Conflicts in Terms and Conditions for Bids

If any conflicts exist between the Terms and Conditions for Bids and the standard form of agreement between the owner and Bidder, the standard form of agreement between the owner and bidder shall prevail.

21. Insurance

All bidders shall have the appropriate amount of insurance while delivering the items once awarded, this coverage shall be present as to cover all losses up until the City accepts the items in writing.

A. Comprehensive General Liability and Property Damage Insurance.

The bidder shall take out and maintain during the life of this Contract such Comprehensive General Liability and Property Damage Insurance as shall protect the City from claims for damages or personal injury, including accidental death, as well as from claims for property damages which may arise from delivering the item under this contract, whether such operations be by himself or by a subcontractor or by anyone directly or indirectly employed by either of them, and the minimum amounts of such insurance shall be as follows:

Bodily Injury.

- (1) Each Occurrence - \$1,000,000
- (2) Annual Aggregate - \$2,000,000

Property Damage Insurance.

- (1) Each Occurrence - \$1,000,000
- (2) Annual Aggregate - \$2,000,000

B. Comprehensive Automobile Liability.

Bodily Injury

- (1) Each Person - \$500,000

(2) Each Accident - \$1,000,000

Property Damage

(1) Each Occurrence - \$1,000,000

22. Disclosure of Interested Parties

Texas Government Code Section 2252.908 requires that parties contracting with governmental entities submit a disclosure of interested parties form for contracts entered into after January 1, 2016. Successful bidders shall electronically submit the form at the following website: <https://www.ethics.state.tx.us/filinginfo/1295/> and provide the City with a certified copy prior to Council approval of the Bid award.

23. Acknowledgement – “Boycott Israel”

By signing and submitting this bid the vendor hereby verifies that it does not boycott Israel and will not boycott Israel during the term of this contract. Boycotting Israel is defined in Texas Government Code section 808.001 to mean refusing to deal with, terminating business activities with, or taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes.

24. Acknowledgement – “Boycott Energy Companies”

By signing and submitting this bid the vendor hereby verifies that it does not boycott energy companies and will not boycott energy companies during the term of the contract. “Boycott energy company” is defined in Texas Government Code section 809.001 to mean, without an ordinary business purpose, refusing to deal with terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with a company because the company: (A) engages in the exploration, production, utilization, transportation, sale, or manufacturing of fossil fuel-based energy and does not commit or pledge to meet environmental standards beyond applicable federal and state law; or (B) does business with a company described by Paragraph (A).

25. Acknowledgement – “Prohibition on contracts with companies that discriminate against firearm and ammunition industries”

By signing and submitting this bid the vendor hereby verifies that it does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association and will not discriminate during the term of the contract against a firearm entity or firearm trade association. Discriminate against a firearm entity or a firearm trade association are defined in Texas Government Code section 2274.001 as (A) with respect to the entity or association, to (i) refuse to engage in the trade of any goods or services; (ii) refrain from continuing an existing business relationship; (iii) terminate an existing business relationship; or (iv) otherwise express a prejudice against the entity or association; and (B) does not include the established policies of a merchant, retail seller, or platform that restrict or prohibit the listing or selling of ammunition, firearms, or firearm accessories.

SIGNATURE: _____ DATE: _____

PRINT NAME: _____

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BID PROPOSAL

The undersigned, as Bidder, declares that the only person or parties interested in this Bid proposal ("Bid") as principals are those named herein, that this Bid is made without collusion with any other person, firms, or corporation, that he has carefully examined the form of contract, Notice to Bidders, Specifications and the Plans therein referred to, and has carefully examined the locations, conditions, and classes of materials of the proposed work, and agrees that he will provide all the necessary labor, machinery, tools, apparatus, and other items incidental to construction, and will do all the work and furnish all the materials called for in the Contract and Specifications in the manner prescribed and according to the requirements of the Engineer as herein set forth.

It is understood that the following quantities of work to be done at unit prices are approximate only, and are intended principally to serve as a guide in evaluating bids. Payments for such items will be made on the basis of the actual quantity incorporated in the Work.

It is further agreed that the quantities of work to be done at unit prices and material to be furnished may be increased or diminished as may be considered necessary, in the opinion of the Engineer, to complete the Work fully as planned and contemplated, and that all quantities of work, whether increased or decreased, are to be performed at the unit prices set forth below except as provided for in the Specifications.

It is further agreed that lump sum prices may be increased to cover additional work ordered by the Engineer, but not shown on the Plans or required by the Specifications, in accordance with the provisions of the General Conditions. Similarly, they may be decreased to cover deletion of work so ordered.

It is understood and agreed that the work is to be completed in full within the time shown in the Instruction to Bidders.

Accompanying this Bid is a Cashier's Check or Bid Bond in the amount of _____

_____ DOLLARS (\$ _____
_____), which is a minimum of five (5%) percent of the total amount of the Base Bid.

The bid security accompanying this Bid shall be returned to the Bidder, unless, in case of the acceptance of the Bid the Bidder shall fail to execute a Contract and file a Performance and Payment Bond within ten (10) days after its acceptance, in which case the Bid security shall become the property of the OWNER, and shall be considered as payment for damages due to delay and other inconveniences suffered by the OWNER on account of such failure of the Bidder. It is understood that the OWNER reserves the right to reject any and all Bids received.

Base Bid

Item No	QTY	Unit	Description	Unit Price	Total Cost
Base Bid Schedule No. 1					
1.01	1	LS	100,000-Gallon Ground Storage tank, not including site work, yard piping or electrical, as drawn and specified, lump sum		\$ -
1.02	1	LS	All site work, including yard piping and appurtenances up to but not including tank foundation, as drawn and specified, lump sum		\$ -
1.03	1	LS	All electrical work, inside and outside tank, as drawn and specified, lump sum		\$ -
1.04	420	LF	Trench Safety, as specified		\$ -
SubTotal Base Bid					\$ -
ALLOWANCES					
2.01	1	LS	Tank Inspector for Coating/Welding Inspection		
2.02	1	LS	Concrete Foundation and Rebar Inspection		
					\$ -
Subtotal Allowance					\$ -
Subtotal Base Bid					\$ -
Subtotal Allowance					\$ -
TOTAL BID PRICE					\$ -

In the event of award of a contract to the undersigned, the undersigned will appear before the authorized representative of the Owner and furnish Performance and Payment bonds for the full amount of the Contract, with the sureties offered by: _____
_____ and _____

To secure proper compliance with the terms and provisions of the Contract to insure and guarantee the work until final completion and acceptance and to guarantee payment of all claims for labor performed and material furnished in fulfillment of the Contract.

The work proposed to be done shall be accepted when fully completed and finished in accordance with Airport Pump Station Update Plan Sheets and Specifications, to the satisfaction of the Engineer.

The undersigned certifies that the Bid prices contained in this Bid have been carefully checked and are submitted as correct and final.

Receipt is hereby acknowledged of the following addenda to the Contract Documents:

Addendum No. 1 dated _____ Received _____

Addendum No. 2 dated _____ Received _____

Addendum No. 3 dated _____ Received _____

This is a Bid of: _____ Corporation, organized and existing
under the laws of the State of _____, or; a Partnership consisting of _____
_____, or; and Individual, doing business as _____.

By: _____

Seal, if a Corporation

TITLE

MAILING ADDRESS

STREET ADDRESS

CITY AND STATE

TELEPHONE NUMBER

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BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned,

_____ as Principal, and firmly bound unto _____ as owner in the sum of \$ _____ as the proper measure of liquidated damages for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this _____ day of _____, 2024.

The condition of the above obligation is such that whereas the Principal has submitted to The City of Killeen a certain bid, attached hereto and hereby made a part hereof to enter into a contract in writing, for the **Airport Pump Station Update**

Now, Therefore,

- (a) If said Bid shall be rejected, or in the alternate,
- (b) If said Bid shall be accepted and the Principal shall be accepted and the Principal shall execute and deliver a contract in the Form of contract attached hereto (Properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid,

Then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any breach of condition hereunder shall be in the face amount of this bond and forfeited as a proper measure of liquidated damages.

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

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year set forth above.

_____(L.S.)
Principal

Surety

By: _____

SEAL

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NON-COLLUSION AFFIDAVIT

STATE OF _____ §

COUNTY OF _____ §

Each of the undersigned, being first duly sworn, deposes and says that:

- A. _____ is the _____ of _____
and _____ is the _____ of _____,
which entity(ies) is/are the _____ of _____, the entity
making the foregoing Proposal.
- B. The Proposal is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, joint venture, limited liability company or corporation; the Proposal is genuine and not collusive or sham; the Proposer has not directly or indirectly induced or solicited any other Proposer to put in a false or sham proposal, and has not directly or indirectly colluded, conspired, connived or agreed with any Proposer or anyone else to put in a sham Proposal or that anyone shall refrain from proposing; the Proposer has not in any manner, directly or indirectly, sought by agreement, communication or conference with anyone to fix the prices of the Proposer or any other Proposer, or to fix any overhead, profit or cost element included in the Proposal, or of that of any other Proposer, or to secure any advantage against the Owner or anyone interested in the proposed agreement; all statements contained in the Proposal are true; and, further, the Proposer has not, directly or indirectly, submitted its prices or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, joint venture, limited liability company, organization, Proposal depository or any member, partner, joint venturer or agent thereof to effectuate a collusive or sham Proposal.
- C. The Proposer will not, directly or indirectly, divulge information or data regarding the price or other terms of its Proposal to any other Proposer, or seek to obtain information or data regarding the price or other terms of any other Proposal, until after award of the Agreement or rejection of all Proposals and cancellation of the RFP.

(Signature)

(Name Printed)

(Title)

(Signature)

(Name Printed)

(Title)

DISCLOSURE OF LOBBYING ACTIVITIES

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352

Approved by OMB

0348-0046

(See reverse for public burden disclosure.)

1. Type of Federal Action: ☐ a. contract ☐ b. grant ☐ c. cooperative agreement ☐ d. loan ☐ e. loan guarantee ☐ f. loan insurance		2. Status of Federal Action: ☐ a. bid/offer/application ☐ b. initial award ☐ c. post-award		3. Report Type: ☐ a. initial filing ☐ b. material change For Material Change Only: year _____ quarter _____ date of last report _____	
4. Name and Address of Reporting Entity: ☐ Prime ☐ Subawardee Tier _____, if known: Congressional District, if known: 4c			5. If Reporting Entity in No. 4 is a Subawardee, Enter Name and Address of Prime: Congressional District, if known:		
6. Federal Department/Agency:			7. Federal Program Name/Description: CFDA Number, if applicable: _____		
8. Federal Action Number, if known:			9. Award Amount, if known: \$ _____		
10. a. Name and Address of Lobbying Registrant (if individual, last name, first name, MI):			b. Individuals Performing Services (including address if different from No. 10a) (last name, first name, MI):		
11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.			Signature: _____ Print Name: _____ Title: _____ Telephone No.: _____ Date: _____		
Federal Use Only:				Authorized for Local Reproduction Standard Form LLL (Rev. 7-97)	

PRINT

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a covered Federal action. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.
2. Identify the status of the covered Federal action.
3. Identify the appropriate classification of this report. If this is a followup report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.
4. Enter the full name, address, city, State and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.
5. If the organization filing the report in item 4 checks "Subawardee," then enter the full name, address, city, State and zip code of the prime Federal recipient. Include Congressional District, if known.
6. Enter the name of the Federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.
7. Enter the Federal program name or description for the covered Federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.
8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitation for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Include prefixes, e.g., "RFP-DE-90-001."
9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.
10. (a) Enter the full name, address, city, State and zip code of the lobbying registrant under the Lobbying Disclosure Act of 1995 engaged by the reporting entity identified in item 4 to influence the covered Federal action.

(b) Enter the full names of the individual(s) performing services, and include full address if different from 10 (a). Enter Last Name, First Name, and Middle Initial (MI).
11. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

According to the Paperwork Reduction Act, as amended, no persons are required to respond to a collection of information unless it displays a valid OMB Control Number. The valid OMB control number for this information collection is OMB No. 0348-0046. Public reporting burden for this collection of information is estimated to average 10 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0046), Washington, DC 20503.

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CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

FORM CIQ

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

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).

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.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY

Date Received

1 Name of vendor who has a business relationship with local governmental entity.

2 ☐ 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.)

3 Name of local government officer about whom the information is being disclosed.

Name of Officer

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.

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?

☐ Yes ☐ No

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?

☐ Yes ☐ No

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.

6 ☐ 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).

7

Signature of vendor doing business with the governmental entity

Date

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.

STATEMENT OF QUALIFICATIONS

TABLE 1 – GENERAL INFORMATION				
A. COMPANY DATA				
Organization Doing Business:				
Business Address:				
Telephone Number:				
Fax Number:				
Form of Business:	Corporation	Partnership	Individual	Joint Venture
IF A CORPORATION				
Date of Incorporation:				
State Incorporated:				
President's Name:				
Vice President's Name:				
IF A PARTNERSHIP				
Date of Organization:				
Type	General		Limited	
IF AN INDIVIDUAL				
Name:				
Business Address:				
IF A JOINT VENTURE				
Name of Manager:				
Name of Firm:				
Name of Individual Companies:				
B. BUSINESS INFORMATION				
Current Number of Full Time Employees:		Past Year's Revenues:		
Average Number of Projects Annually:		Average Construction Cost of Project:		
C. DIVISION OF WORK BETWEEN CONTRACTOR AND SUBCONTRACTORS				
1. List work that will be provided by Offeror (Prime Contractor) using its own resources.				
2. List work that will be provided by Subcontractors on this project.				

TABLE 2 – CONSTRUCTION EXPERIENCE

1. Years of experience on boring/jacking drainage culverts on railroad projects:			
As a General Contractor:		Number of Total Projects:	
2. Number of boring/jacking drainage culverts on railroad projects completed in the past five (5) years?			
3. Has this or a predecessor company ever defaulted on a project or failed to complete work award to it?			
4. Has this or a predecessor company ever been released from a bid or proposal in the past ten (10) years?			
5. Has this or a predecessor company ever been disqualified as a bidder or offeror on any project within the last five (5) years?			
6. Is offering company currently involved in any litigation or contemplating any litigation?			
7. Has this or a predecessor company ever refused to construct or refused to provide materials defined in Contract Documents on a project?			
8. Are there any liens currently filed against the offeror by either subcontractor or material suppliers on previous projects?			

TABLE 3 – PROPOSED KEY PERSONNEL

PROJECT MANAGER	
Name of Project Manager	
Years of Experience as PM	
Number of Similar Projects as PM with this company	
Number of Similar Projects with other companies (PM)	
Current Assignments	
% of time dedicated to this project	
Reference Project	
Project Name:	Reference Name:
Title:	Organization:
Telephone Number:	Email:
PROJECT SUPERINTENDENT	
Name of Superintendent	
Years of Experience as Superintendent	
Number of Similar Projects as Super with this company	
Number of Similar Project with other companies (Super)	
Current Assignments	
% of time dedicated to this project	
Reference Project	
Project Name:	Reference Name:
Title:	Organization:
Telephone Number:	Email:

TABLE 4 – SIMILAR PROJECTS COMPLETED WITHIN LAST 5 YEARS**REFERENCE PROJECT 1**

Project Description

Owner	Project Name	Contract Amount	Date Completed	% Change Orders

Owner's Reference Information

Name	Title	Organization	Telephone	E-Mail

Engineer's Reference Information

Name	Title	Company	Telephone	E-Mail

REFERENCE PROJECT 2

Project Description

Owner	Project Name	Contract Amount	Date Completed	% Change Orders

Owner's Reference Information

Name	Title	Organization	Telephone	E-Mail

Engineer's Reference Information

Name	Title	Company	Telephone	E-Mail

REFERENCE PROJECT 3

Project Description

Owner	Project Name	Contract Amount	Date Completed	% Change Orders

Owner's Reference Information

Name	Title	Organization	Telephone	E-Mail

Engineer's Reference Information

Name	Title	Company	Telephone	E-Mail

TABLE 5 – SUBCONTRACTORS AND SUPPLIERS		
PROJECT SPECIFIC SUBCONTRACTORS (greater than 10% of work)		
Name	Work to be Provided	% of Contract
Provide a list of major equipment or material suppliers for use on project.		
Supplier Name	Material or Equipment Supplied	

AFFIDAVIT

State _____

County of _____

_____, being duly sworn deposes and attests that he/she is
(name)
_____ and is a duly authorized representative of the Offeror
(title)

submitting the foregoing Statement of Qualifications and related information, that he/she has read such documents, that he/she is authorized to submit such information on behalf of the Offeror, and that such documents are true and correct and contain no factual errors or material misrepresentations.

Signature

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

Notary Public

My Commission expires: _____

Statement of Qualifications

Litigation Summary

Summary of current or past project-necessitated litigation pursued by, or brought against, your firm in the previous five (5) years:

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

**CERTIFICATION OF CONTRACTOR
REGARDING DEBARMENT, SUSPENSION AND OTHER RESPONSIBILITY MATTERS**

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 7 CFR Part 3017, Section 3017.510, Participants' responsibilities. The regulations were published as Part IV of the January 30, 1989 Federal Register (pages 4722-4733).

BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS

- 1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
 - a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transaction by an Federal department or agency;
 - b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
 - d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.
- 2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Organization Name

Project Number and Name

Name(s) and Title(s) of Authorized Representatives

Signature(s)

Date

PROJECT: 100,000 Gallon Ground Stand Pipe

Instructions for Certification Regarding Debarment, Suspension, and Other Responsibility Matters

- 1) By signing and submitting this form, the prospective primary participant is providing the certification set out on the corresponding certification in accordance with these instructions.
- 2) The inability of a person to provide the certification required below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out on this form. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such person from participation in this transaction.
- 3) The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.
- 4) The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if at any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- 5) The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "Primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage section of the rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of those regulations.
- 6) The prospective primary participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.
- 7) The prospective primary participant further agrees by submitting this form that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- 8) A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Non-procurement List.
- 9) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- 10) Except for transactions authorized under paragraph 6 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

CERTIFICATE OF COPORATE RESOLUTION

I, _____, Secretary, hereby certify as follows:

1. I am the duly elected, qualified and acting Secretary of _____,
a _____ corporation, (the "Corporation").
2. The Corporation is duly incorporated, legally existing and in good standing under the laws of the State
of _____, and is duly qualified to transact business and to own, operate and develop its
properties in the State of _____.
3. Attached hereto and made a part hereof is a true and complete copy of the resolution duly and legally
adopted on _____ by the Board of Directors of the Corporation in
accordance with the By-laws of the Corporation and applicable law. Such resolutions have been duly
entered in the minutes of such meeting in the minute book of the corporation and have not been
rescinded or modified in any respect and are presently in full force and effect.
4. The following persons are duly elected, qualified and acting officers of the corporation and hold
respective offices set opposite their names:

_____ : President

_____ : Vice President

_____ : Secretary

TO CERTIFY WHICH I have executed this certificate this _____ day of _____,
2020.

Secretary

STATE OF _____
COUNTY OF _____

This instrument was acknowledged before me on the _____ day of _____,
2020 by _____, Secretary, of
_____, a corporation, on behalf of
said Corporation.

Notary Public, State of _____
Name: _____
My commission expires _____

LOCAL GOVERNMENT OFFICER CONFLICTS DISCLOSURE STATEMENT

FORM CIS

(Instructions for completing and filing this form are provided on the back.)

This is the notice to the appropriate local governmental entity that the following local government officer has become aware of facts that require the officer to file this statement in accordance with chapter 176, Local Government Code.

OFFICE USE ONLY

Date Received

1 Name of Local Government Officer

2 Office Held

3 Name of person described by Sections 176.002(a) and 176.003(a), Local Government Code

4 Description of the nature and extent of employment or business relationship with person named in item 3

5 List gifts if aggregate value of the gifts received from person named in item 3 exceed \$250

Date Gift Received _____ Description of Gift _____ ☐ Did Not Accept Gift

Date Gift Received _____ Description of Gift _____ ☐ Did Not Accept Gift

Date Gift Received _____ Description of Gift _____ ☐ Did Not Accept Gift

(attach additional forms as necessary)

6 AFFIDAVIT

I swear under penalty of perjury that the above statement is true and correct. I acknowledge that the disclosure applies to a family member (as defined by Section 176.001(2), Local Government Code) of a government officer. I also acknowledge that this statement covers the 12-month period described by Section 176.003(a)(2)(b), Local Government Code.

Signature of Local Government Officer

AFFIX NOTARY STAMP / SEAL ABOVE

Sworn to and subscribed before me, by the said _____, this the _____ day
of _____, 20 _____, to certify which, witness my hand and seal of office.

Signature of officer administering oath

Printed name of officer administering oath

Title of officer administering oath

LOCAL GOVERNMENT OFFICER CONFLICTS DISCLOSURE STATEMENT

Section 176.003 of the Local Government Code requires certain local government officers to file this form. A "local government officer" is defined as a member of a governing body of a local government entity or a director, superintendent, administrator, president, or other person designated as the executive officer of the local government entity. This form is required to be filed with the records administrator of the local governmental entity not later than 5 p.m. on the seventh business day after the date on which the officer becomes aware of the facts that require the filing of this statement.

A local government officer commits an offense if the officer knowingly violates Section 176.003, Local Government Code. An offense under this section is a Class C misdemeanor.

Please refer to chapter 176 of the Local Government Code for detailed information regarding the requirement to file this form.

INSTRUCTIONS FOR COMPLETING THIS FORM

The following numbers correspond to the numbered boxes on the other side.

- 1. Name of Local Government Officer.** Enter the name of local government officer filing this statement.
- 2. Office Held.** Enter the name of the office held by the local government officer filing this statement.
- 3. Name of person described by Sections 176.002(a) and 176.003(a), Local Government Code.** Enter the name of the person described by Section 176.002, Local Government Code with whom the officer has an employment or other business relationship as described by Section 176.003(a), Local Government Code.
- 4. Description of the nature and extent of employment or business relationship with person named in item 3.** Describe the nature and extent of the relationship of the employment or other business relationship with the person in item 3 as described by Section 176.003(a), Local Government Code.
- 5. List gifts if aggregate value of the gifts received from person named in number 3 exceed \$250.** List gifts received during the 12-month period (described by Section 176.003(a)(2)(B), Local Government Code) by the local government officer or family member of the officer from the person named in number 3 that in the aggregate exceed \$250 in value.
- 6. Affidavit.** Signature of local government officer.

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This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification.

**STANDARD FORM OF AGREEMENT
BETWEEN OWNER AND CONTRACTOR
ON THE BASIS OF A STIPULATED PRICE**

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

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

This document has been approved and endorsed by

The Associated General Contractors of America

Construction Specifications Institute

This Standard Form of Agreement has been prepared for use with the Standard General Conditions of the Construction Contract (No. 1910-8, 1996 Edition). Their provisions are interrelated, and a change in one may necessitate a change in the other. The suggested language for instructions of bidders contained in the Guide to the Preparation of Instructions to Bidders (No. 1910-12, 1996 Edition) is also carefully interrelated with the language of this Agreement. Comments concerning their usage are contained in the EJCDC User's Guide (No. 1910-50). See also Guide to the Preparation of Supplementary Conditions (No. 1910-17, 1996 Edition).

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National Society of Professional Engineers
1420 King Street, Alexandria, VA 22314-2715

American Consulting Engineers Council
1015 15th Street, N.W., Washington, DC 20005

American Society of Civil Engineers
345 East 47th Street, New York, NY 10017

Introduction

This Agreement between Owner and Contractor on the Basis of a Stipulated Price (“Agreement”) has been prepared for use with the Guide to the Preparation of Instructions to Bidders (“Instructions”) (No. 1910-12, 1996 Edition) and with the Standard General Conditions of the Construction Contract (“General Conditions”) (No. 1910-8, 1996 Edition). Their provisions are interrelated, and a change in one may necessitate a change in the others. Comments concerning their usage are contained in the Commentary on Agreements for Engineering Services and Construction Related Documents (“Commentary”) (No. 1910-9, 1996 Edition). For guidance in the preparation of Supplementary Conditions and coordination with Instructions to Bidders, see Guide to the Preparation of Supplementary Conditions (“Supplementary Conditions”) (No. 1910-17, 1996 Edition). See also Guide to Preparation of the Bid Form (“Bid Form”) (No. 1910-18, 1996 Edition). The EJCDC has not prepared a suggested form of Advertisement or Invitation to Bid because such documents will vary widely in response to statutory requirements.

This form and the other Bidding Documents prepared and issued by the EJCDC assume acceptance of the Project Manual concept of the Construction Specifications Institute which provides for an organizational format for location of all bound documentary information for a construction project, namely: Bidding Requirements (which term refers to the Advertisement or Invitation to Bid, the Instructions, and any bid form that may be suggested or prescribed, all of which provide information and guidance for all Bidders) and the Contract Documents (defined in Article 1 of the General Conditions), which include the Agreement, Bonds and Certificates, the General Conditions, the Supplementary Conditions, the Drawings, and the Specifications. The Bidding Requirements are not considered part of the Contract Documents because much of their substance pertains to the relationships prior to the award of the Contract and has little effect or impact thereafter and because many contracts are awarded without going through the bidding process. In some cases, however, the actual Bid may be attached as an exhibit to the Agreement to avoid extensive retyping. (The terms “Bidding Documents” and “Bidding Requirements” are defined in Article 1 of the General Conditions.) The Project Manual concept is explained in the *Manual of Practice* issued by the Construction Specifications Institute.

Suggested language is presented herein with “Notes to User” to assist in preparing the Agreement. Much of the language should be usable on most projects, but modifications and additional provisions will often be necessary. The suggested language has been coordinated with the other standard forms produced by the EJCDC. When modifying the suggested language or writing additional provisions, the user must check the other documents thoroughly for conflicts and coordination of language usage and make appropriate revisions in all affected documents.

For brevity, referenced paragraphs of the Instructions to Bidders with the prefix “I,” those of the Bid Form with the prefix “BF,” and those of this Agreement with the prefix “A.”

Refer to Contract Documents Bibliography (No. 1910-24, 1996 Edition), which will be helpful in preparing the Agreement, and see in particular the discussions in EJCDC’s *Recommended Competitive Bidding Procedures for Construction Projects* (“Bidding Procedures”) (No. 1910-9-D, 1987 Edition) by Robert J. Smith, P.E., Esq., on the particular paragraphs of which frequent reference is made below.

NOTES:

1. EJCDC publications may be ordered from NSPE headquarters at 1420 King Street, Alexandria VA 22314-2715; or ACEC headquarters at 1015 15th Street NW, Washington DC 20005; or ASCE headquarters at 345 East 47th Street, New York NY 10017.
2. CSI publications may be ordered from CSI headquarters at 601 Madison Street, Alexandria VA 22314.
3. AIA publications may be obtained from most local AIA chapter offices or by writing to AIA headquarters at 1735 New York Avenue NW, Washington, DC 20006.
4. The Associated General Contractors of America has a series of construction related documents which may be of interest. The AGC’s Publications and Services Catalog may be obtained from AGC headquarters at 1957 E Street NW, Washington, DC 20006.

**EJCDC
STANDARD FORM OF AGREEMENT
BETWEEN OWNER AND CONTRACTOR
ON THE BASIS OF A STIPULATED PRICE**

THIS AGREEMENT is by and between City of Killeen (hereinafter called OWNER) and _____
_____.(hereinafter called CONTRACTOR).

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

ARTICLE 1 - WORK

1.01 CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally referred to as **Airport Pump Station Update** and described as follows:

Construction of 100,000 gallon stand pipe storage tank with associated pipe, valves, and mixer. Work also includes all electrical upgrades associated with the project.

ARTICLE 2 - THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

Same as 1.01

ARTICLE 3 - ENGINEER

3.01 The Project has been designed by

KSA Engineers Inc.

who is hereinafter called ENGINEER and who is to act as OWNER's representative, assume all duties and responsibilities, and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - CONTRACT TIMES

4.01 Time of the Essence

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

4.02 Days to Achieve Substantial Completion and Final Payment

A. The Work will be substantially completed within 360 days after the date when the Contract Times commence to run as provided in paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions within 390 days after the date when the Contract Times commence to run.

4.03 Liquidated Damages

A. CONTRACTOR and OWNER recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not completed within the times specified in paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by OWNER if the Work is not completed on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty), CONTRACTOR shall pay OWNER \$ 1,000 for each day that expires after the time specified in paragraph 4.02 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if CONTRACTOR shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by OWNER, CONTRACTOR shall pay OWNER \$ 1,000 for each day that expires after the time specified in paragraph 4.02 for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 5 - CONTRACT PRICE

5.01 OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to paragraphs 5.01.A, 5.01.B, and 5.01.C below:

A. For all Work other than Unit Price Work, a Lump Sum of: **N/A**

_____ (\$ _____) to be determined.
(use words) (figure)

All specific cash allowances are included in the above price and have been computed in accordance with paragraph 11.02 of the General Conditions.

B. For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of that item as indicated in this paragraph 5.01.B.

As provided in paragraph 11.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by ENGINEER as provided in paragraph 9.08 of the General Conditions. Unit prices have been computed as provided in paragraph 11.03 of the General Conditions.

C. For all Work, at the prices stated in CONTRACTOR's Bid, attached hereto as an exhibit.

ARTICLE 6 - PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

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

6.02 *Progress Payments; Retainage*

A. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment on or about the 20th day of each month during performance of the Work as provided in paragraphs 6.02.A.1 and 6.02.A.2 below. All such payments will be measured by the schedule of values established in paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements:

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as ENGINEER may determine or OWNER may withhold, in accordance with paragraph 14.02 of the General Conditions:

a. 95 % of Work completed (with the balance being retainage).

b. 95 % of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

2. Upon Substantial Completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to 95 % of the Work completed, less such amounts as ENGINEER shall determine, or OWNER may withhold, in accordance with paragraph 14.02.B.5 of the General Conditions.

6.03 Final Payment

A. Upon final completion and acceptance of the Work in accordance with paragraph 14.07 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in said paragraph 14.07.

ARTICLE 7 - INTEREST

7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the maximum rate as allowed by law at the place of the project.

ARTICLE 8 - CONTRACTOR'S REPRESENTATIONS

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

A. CONTRACTOR has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. CONTRACTOR has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. CONTRACTOR is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. CONTRACTOR has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions and (2) reports and drawings of a Hazardous Environmental Condition, if any, at the Site which has been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions.

E. CONTRACTOR has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, including applying the specific means, methods, techniques, sequences, and procedures of construction, if any, expressly required by the Contract Documents to be employed by CONTRACTOR, and safety precautions and programs incident thereto

F. CONTRACTOR does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

G. CONTRACTOR is aware of the general nature of work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Contract Documents.

H. CONTRACTOR has correlated the information known to CONTRACTOR, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

J. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

B. The documents listed in paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in paragraph 3.04 of the General Conditions.

ARTICLE 10 - MISCELLANEOUS

10.01 *Terms*

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

10.02 *Assignment of Contract*

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

10.03 *Successors and Assigns*

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

10.04 *Severability*

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

10.05 *Other Provisions*

This contract shall be governed by the laws of the state of Texas, and venue shall be in Bell County.

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

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

OWNER:

CONTRACTOR:

CITY OF KILLEEN

By: _____

By: _____

[CORPORATE SEAL]

[CORPORATE SEAL]

Attest _____

Attest _____

Address for giving notices:

Address for giving notices:

P. O. BOX 1329

KILLEEN, TX 76540-1329

(If OWNER is a corporation, attach evidence of authority to sign. If OWNER is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of OWNER-CONTRACTOR Agreement.)

License No. _____

(Where applicable)

Agent for service of process: _____

(If CONTRACTOR is a corporation or a partnership, attach evidence of authority to sign.)

Designated Representative:

Designated Representative:

Name: Steve Kana, P.E.

Name: _____

Title: Assistant City Engineer

Title: _____

Address: 805 West Jasper Drive

Address: _____

Killeen, TX 76542

Phone: (254) 501-7623

Phone: _____

Facsimile: (254) 501-6321

Facsimile: _____

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Performance Bond

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place
of Business):

OWNER (Name and Address):

CONTRACT

Date:

Amount:

Description (Name and Location):

BOND

Date (Not earlier than Contract Date):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent or representative.

CONTRACTOR AS PRINCIPAL

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

SURETY

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRINCIPAL

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

SURETY

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

EJCDC No. 1910-28-A (1996 Edition)

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, and the American Institute of Architects.

1. The CONTRACTOR and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Contract, which is incorporated herein by reference.

2. If the CONTRACTOR performs the Contract, the Surety and the CONTRACTOR have no obligation under this Bond, except to participate in conferences as provided in paragraph 3.1.

3. If there is no OWNER Default, the Surety's obligation under this Bond shall arise after:

3.1. The OWNER has notified the CONTRACTOR and the Surety at the addresses described in paragraph 10 below, that the OWNER is considering declaring a CONTRACTOR Default and has requested and attempted to arrange a conference with the CONTRACTOR and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Contract. If the OWNER, the CONTRACTOR and the Surety agree, the CONTRACTOR shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive the OWNER's right, if any, subsequently to declare a CONTRACTOR Default; and

3.2. The OWNER has declared a CONTRACTOR Default and formally terminated the CONTRACTOR's right to complete the Contract. Such CONTRACTOR Default shall not be declared earlier than twenty days after the CONTRACTOR and the Surety have received notice as provided in paragraph 3.1; and

3.3. The OWNER has agreed to pay the Balance of the Contract Price to:

3.3.1. The Surety in accordance with the terms of the Contract;

3.3.2 Another contractor selected pursuant to paragraph 4.3 to perform the Contract.

4. When the OWNER has satisfied the conditions of paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

4.1. Arrange for the CONTRACTOR, with consent of the OWNER, to perform and complete the Contract; or

4.2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the OWNER for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the OWNER and the contractor selected with the OWNER's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the Bonds issued on the Contract, and pay to the OWNER the amount of damages as described in paragraph 6 in excess of the Balance of the Contract Price incurred by the OWNER resulting from the CONTRACTOR Default; or

4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances;

4.4.1 After investigation, determine the amount for which it may be liable to the OWNER and, as soon as practicable after the amount is determined, tender payment therefor to the OWNER; or

4.4.2 Deny liability in whole or in part and notify the OWNER citing reasons therefor.

5. If the Surety does not proceed as provided in paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the OWNER to the Surety demanding that the Surety perform its obligations under this Bond, and the OWNER shall be entitled to enforce any remedy available to the OWNER. If the Surety proceeds as provided in paragraph 4.4, and the OWNER refuses the payment tendered or the Surety has denied

liability, in whole or in part, without further notice the OWNER shall be entitled to enforce any remedy available to the OWNER.

6. After the OWNER has terminated the CONTRACTOR's right to complete the Contract, and if the Surety elects to act under paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the OWNER shall not be greater than those of the CONTRACTOR under the Contract, and the responsibilities of the OWNER to the Surety shall not be greater than those of the OWNER under the Contract. To a limit of the amount of this Bond, but subject to commitment by the OWNER of the Balance of the Contract Price to mitigation of costs and damages on the Contract, the Surety is obligated without duplication for:

6.1. The responsibilities of the CONTRACTOR for correction of defective Work and completion of the Contract;

6.2. Additional legal, design professional and delay costs resulting from the CONTRACTOR's Default, and resulting from the actions or failure to act of the Surety under paragraph 4; and

6.3. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of the CONTRACTOR.

7. The Surety shall not be liable to the OWNER or others for obligations of the CONTRACTOR that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the OWNER or its heirs, executors, administrators, or successors.

8. The Surety hereby waives notice of any change, including changes of time, to the Contract or to related subcontracts, purchase orders and other obligations.

9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after CONTRACTOR Default or within two years after the CONTRACTOR ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

10. Notice to the Surety, the OWNER or the CONTRACTOR shall be mailed or delivered to the address shown on the signature page.

11. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

12. Definitions.

12.1 Balance of the Contract Price: The total amount payable by the OWNER to the CONTRACTOR under the Contract after all proper adjustments have been made, including allowance to the CONTRACTOR of any amounts received or to be received by the OWNER in settlement of insurance or other Claims for damages to which the CONTRACTOR is entitled, reduced by all valid and proper payments made to or on behalf of the CONTRACTOR under the Contract.

12.2. Contract: The agreement between the OWNER and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.

12.3. CONTRACTOR Default: Failure of the CONTRACTOR, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.

12.4. OWNER Default: Failure of the OWNER, which has neither been remedied nor waived, to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof.

(FOR INFORMATION ONLY--Name, Address and Telephone)
AGENT or BROKER: OWNER'S REPRESENTATIVE (Engineer or other party):

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Payment Bond

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place
of Business):

OWNER (Name and Address):

CONTRACT

Date:

Amount:

Description (Name and Location):

BOND

Date (Not earlier than Contract Date):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Payment Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

Company: (Corp. Seal)

Signature: _____

Name and Title:

SURETY

Company: (Corp. Seal)

Signature: _____

Name and Title:

(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRINCIPAL

Company: (Corp. Seal)

Signature: _____

Name and Title:

SURETY

Company: (Corp. Seal)

Signature: _____

Name and Title:

EJCDC No. 1910-28-B (1996 Edition)

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, the American Institute of Architects, the American Subcontractors Association, and the Associated Specialty Contractors.

1. The CONTRACTOR and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the OWNER to pay for labor, materials and equipment furnished for use in the performance of the Contract, which is incorporated herein by reference.

2. With respect to the OWNER, this obligation shall be null and void if the CONTRACTOR:

2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and

2.2. Defends, indemnifies and holds harmless the OWNER from all claims, demands, liens or suits by any person or entity who furnished labor, materials or equipment for use in the performance of the Contract, provided the OWNER has promptly notified the CONTRACTOR and the Surety (at the addresses described in paragraph 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the CONTRACTOR and the Surety, and provided there is no OWNER Default.

3. With respect to Claimants, this obligation shall be null and void if the CONTRACTOR promptly makes payment, directly or indirectly, for all sums due.

4. The Surety shall have no obligation to Claimants under this Bond until:

4.1. Claimants who are employed by or have a direct contract with the CONTRACTOR have given notice to the Surety (at the addresses described in paragraph 12) and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

4.2. Claimants who do not have a direct contract with the CONTRACTOR:

1. Have furnished written notice to the CONTRACTOR and sent a copy, or notice thereof, to the OWNER, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and

2. Have either received a rejection in whole or in part from the CONTRACTOR, or not received within 30 days of furnishing the above notice any communication from the CONTRACTOR by which the CONTRACTOR had indicated the claim will be paid directly or indirectly; and

3. Not having been paid within the above 30 days, have sent a written notice to the Surety and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the CONTRACTOR.

5. If a notice required by paragraph 4 is given by the OWNER to the CONTRACTOR or to the Surety, that is sufficient compliance.

6. When the Claimant has satisfied the conditions of paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:

6.1. Send an answer to the Claimant, with a copy to the OWNER, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

6.2. Pay or arrange for payment of any undisputed amounts.

7. The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

8. Amounts owed by the OWNER to the CONTRACTOR under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any Performance Bond. By the CONTRACTOR furnishing and the OWNER accepting this Bond, they agree that all funds earned by the CONTRACTOR in the performance of the Contract are dedicated to satisfy obligations of the CONTRACTOR and the Surety under this Bond, subject to the OWNER's priority to use the funds for the completion of the Work.

9. The Surety shall not be liable to the OWNER, Claimants or others for obligations of the CONTRACTOR that are unrelated to the Contract. The OWNER shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

10. The Surety hereby waives notice of any change, including changes of time, to the Contract or to related Subcontracts, purchase orders and other obligations.

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by paragraph 4.1 or paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the OWNER or the CONTRACTOR shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, the OWNER or the CONTRACTOR, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is, that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, the CONTRACTOR shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. DEFINITIONS

15.1. Claimant: An individual or entity having a direct contract with the CONTRACTOR or with a Subcontractor of the CONTRACTOR to furnish labor, materials or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of the CONTRACTOR and the CONTRACTOR's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

15.2. Contract: The agreement between the OWNER and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.

15.3. OWNER Default: Failure of the OWNER, which has neither been remedied nor waived, to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof.

(FOR INFORMATION ONLY--Name, Address and Telephone)

AGENCY or BROKER: OWNER'S REPRESENTATIVE (Engineer or other party):

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This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the Controlling Law.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

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

This document has been approved and endorsed by

The Associated General Contractors of America

Construction Specifications Institute

These General Conditions have been prepared for use with the Owner-Contractor Agreements (No. 1910-8-A-1 or 1910-8-A-2) (1996 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the EJCDC User's Guide (No. 1910-50). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (No. 1910-17) (1996 Edition).

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GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Contract Documents and printed with initial or all capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the Contract Documents.

2. *Agreement*--The written instrument which is evidence of the agreement between OWNER and CONTRACTOR covering the Work.

3. *Application for Payment*--The form acceptable to ENGINEER which is to be used by CONTRACTOR during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

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

6. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

7. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, Bid security form, if any, and the Bid form with any supplements.

8. *Bonds*--Performance and payment bonds and other instruments of security.

9. *Change Order*--A document recommended by ENGINEER which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*--A demand or assertion by OWNER or CONTRACTOR seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*--The entire and integrated written agreement between the OWNER and CONTRACTOR concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*--The Contract Documents establish the rights and obligations of the parties and include the 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) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders, and ENGINEER's written interpretations and clarifications issued on or after the Effective Date of the Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this paragraph are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by OWNER to CONTRACTOR are not Contract Documents.

13. *Contract Price*--The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*--The number of days or the dates stated in the Agreement to: (i) achieve Substantial Completion; and (ii) complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment.

15. *CONTRACTOR*--The individual or entity with whom OWNER has entered into the Agreement.

16. *Cost of the Work*--See paragraph 11.01.A for definition.

17. *Drawings*--That part of the Contract Documents prepared or approved by ENGINEER which graphically shows the scope, extent, and character of the Work to be performed by CONTRACTOR. Shop Drawings and other CONTRACTOR submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *ENGINEER*--The individual or entity named as such in the Agreement.

20. *ENGINEER's Consultant*--An individual or entity having a contract with ENGINEER to furnish services as ENGINEER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

21. *Field Order*--A written order issued by ENGINEER which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

22. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

23. *Hazardous Environmental Condition*--The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

24. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

25. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*--Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

27. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

28. *Notice of Award*--The written notice by OWNER to the apparent successful bidder stating that upon timely compliance by the apparent successful bidder with the conditions precedent listed therein, OWNER will sign and deliver the Agreement.

29. *Notice to Proceed*--A written notice given by OWNER to CONTRACTOR fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform the Work under the Contract Documents.

30. *OWNER*--The individual, entity, public body, or authority with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be performed.

31. *Partial Utilization*--Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

32. *PCBs*--Polychlorinated biphenyls.

33. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

34. *Project*--The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part as may be indicated elsewhere in the Contract Documents.

35. *Project Manual*--The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

36. *Radioactive Material*--Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

37. *Resident Project Representative*--The authorized representative of ENGINEER who may be assigned to the Site or any part thereof.

38. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

39. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

40. *Site*--Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by OWNER which are designated for the use of CONTRACTOR.

41. *Specifications*--That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto.

42. *Subcontractor*--An individual or entity having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the Site.

43. *Substantial Completion*--The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

44. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

45. *Supplier*--A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.

46. *Underground Facilities*--All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable

television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

47. *Unit Price Work*--Work to be paid for on the basis of unit prices.

48. *Work*--The entire completed construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

49. *Work Change Directive*--A written statement to CONTRACTOR issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive 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 Times.

50. *Written Amendment*--A written statement modifying the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the nonengineering or nontechnical rather than strictly construction-related aspects of the Contract Documents.

1.02 Terminology

A. Intent of Certain Terms or Adjectives

1. Whenever in the Contract Documents the terms "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of ENGINEER as to the Work, it is intended that such action or determination will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in 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 or authority to

supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.10 or any other provision of the Contract Documents.

B. *Day*

1. The word “day” shall constitute a calendar day of 24 hours measured from midnight to the next midnight.

C. *Defective*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it does not conform to the Contract Documents or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by OWNER at Substantial Completion in accordance with paragraph 14.04 or 14.05).

D. *Furnish, Install, Perform, Provide*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of CONTRACTOR, “provide” is implied.

E. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used

in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 - PRELIMINARY MATTERS

2.01 *Delivery of Bonds*

A. When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as CONTRACTOR may be required to furnish.

2.02 *Copies of Documents*

A. OWNER shall furnish to CONTRACTOR up to ten copies of the Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

A. CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *CONTRACTOR’s Review of Contract Documents:* Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error, ambiguity, or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents

unless CONTRACTOR knew or reasonably should have known thereof.

B. *Preliminary Schedules:* Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for its timely review:

1. a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing, and processing such submittal; and

3. a preliminary schedule of values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

C. *Evidence of Insurance:* Before any Work at the Site is started, CONTRACTOR and OWNER shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which CONTRACTOR and OWNER respectively are required to purchase and maintain in accordance with Article 5.

2.06 *Preconstruction Conference*

A. Within 20 days after the Contract Times start to run, but before any Work at the Site is started, a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.05.B, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

2.07 *Initial Acceptance of Schedules*

A. Unless otherwise provided in the Contract Documents, at least ten days before submission of the first Application for Payment a conference attended by CON-

TRACTOR, ENGINEER, and others as appropriate will be held to review for acceptability to ENGINEER as provided below the schedules submitted in accordance with paragraph 2.05.B. CONTRACTOR shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to CONTRACTOR until acceptable schedules are submitted to ENGINEER.

1. The progress schedule will be acceptable to ENGINEER if it provides an orderly progression of the Work to completion within any specified Milestones and the Contract Times. Such acceptance will not impose on ENGINEER responsibility for the progress schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefor.

2. CONTRACTOR's schedule of Shop Drawing and Sample submittals will be acceptable to ENGINEER if it provides a workable arrangement for reviewing and processing the required submittals.

3. CONTRACTOR's schedule of values will be acceptable to ENGINEER as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. 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 labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to OWNER.

C. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in Article 9.

3.02 *Reference Standards*

A. *Standards, Specifications, Codes, Laws, and Regulations*

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of OWNER, CONTRACTOR, or ENGINEER, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall any such provision or instruction be effective to assign to OWNER, ENGINEER, or any of ENGINEER's Consultants, agents, or employees any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, CONTRACTOR shall report it to ENGINEER in writing at once. CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as required by paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.04; provided, however, that CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity, or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. 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 ways: (i) a Written Amendment; (ii) a Change Order; or (iii) a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways: (i) a Field Order; (ii) ENGINEER's approval of a Shop Drawing or Sample; or (iii) ENGINEER's written interpretation or clarification.

3.05 *Reuse of Documents*

A. CONTRACTOR and any Subcontractor or Supplier or other individual or entity performing or furnishing any of the Work under a direct or indirect contract with OWNER: (i) shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER or ENGINEER's Consultant, including electronic media editions; and (ii) shall not reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaption by ENGINEER. This prohibition will survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude CONTRACTOR from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 - AVAILABILITY OF LANDS;
SUBSURFACE AND PHYSICAL CONDITIONS;
REFERENCE POINTS

4.01 *Availability of Lands*

A. OWNER shall furnish the Site. OWNER shall notify CONTRACTOR of any encumbrances or restrictions not of general application but specifically related to use of the Site with which CONTRACTOR must comply in performing the Work. OWNER will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If CONTRACTOR and OWNER are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in OWNER's furnishing the Site, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

B. Upon reasonable written request, OWNER shall furnish CONTRACTOR with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and OWNER's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that ENGINEER has used in preparing the Contract Documents; and
2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that ENGINEER has used in preparing the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not

Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER, or any of ENGINEER's Consultants with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which CONTRACTOR is entitled to rely as provided in paragraph 4.02 is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *ENGINEER's Review:* After receipt of written notice as required by paragraph 4.03.A, ENGINEER will promptly review the pertinent condition, determine the necessity of OWNER's obtaining additional exploration or tests with respect thereto, and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER's findings and conclusions.

C. *Possible Price and Times Adjustments*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in paragraph 4.03.A; and

b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of paragraphs 9.08 and 11.03.

2. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. CONTRACTOR knew of the existence of such conditions at the time CONTRACTOR made a final commitment to OWNER in respect of Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment; or

c. CONTRACTOR failed to give the written notice within the time and as required by paragraph 4.03.A.

3. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract

Price or Contract Times, or both, a Claim may be made therefor as provided in paragraph 10.05. However, OWNER, ENGINEER, and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *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 Site is based on information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities, including OWNER, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following will be included in the Contract Price, and CONTRACTOR shall have full responsibility for:

a. reviewing and checking all such information and data,

b. locating all Underground Facilities shown or indicated in the Contract Documents,

c. coordination of the Work with the owners of such Underground Facilities, including OWNER, during construction, and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A),

identify the owner of such Underground Facility and give written notice to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility.

2. If ENGINEER concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price of Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that CONTRACTOR did not know of and could not reasonably have been expected to be aware of or to have anticipated. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, OWNER or CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

4.05 *Reference Points*

A. OWNER shall provide engineering surveys to establish reference points for construction which in ENGINEER's judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the ENGINEER in the preparation of the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER or any of ENGINEER's Consultants with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. CONTRACTOR shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. CONTRACTOR shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible.

D. If CONTRACTOR encounters a Hazardous Environmental Condition or if CONTRACTOR or anyone for whom CONTRACTOR is responsible creates a Hazardous Environmental Condition, CONTRACTOR shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by paragraph 6.16); and (iii) notify OWNER and ENGINEER (and promptly thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. CONTRACTOR shall not be required to resume Work in connection with such condition or in any affected area until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR written

notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by CONTRACTOR, either party may make a Claim therefor as provided in paragraph 10.05.

F. If after receipt of such written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then OWNER may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in paragraph 10.05. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, OWNER shall indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by CONTRACTOR, ENGINEER, or by anyone for whom CONTRACTOR or ENGINEER is responsible. Nothing in this paragraph 4.06.E shall obligate OWNER to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals

and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.F shall obligate CONTRACTOR to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of paragraphs 4.02, 4.03, and 4.04 are not intended to apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 - BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. CONTRACTOR shall furnish performance and payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment is made, except as provided otherwise by Laws or Regulations or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Contract Documents.

B. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

C. If the surety on any Bond furnished by CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.01.B, CONTRACTOR shall within 20 days thereafter substitute another Bond and surety, both of which shall comply with the requirements of paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers; Ratings*

A. All Bonds and insurance required by the Contract Documents to be purchased and maintained by OWNER or

CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed or authorized in Texas to issue Bonds or insurance policies for the limits and coverages so required. Insurance carriers must have at least an "A" rating with AM Best Company. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. CONTRACTOR shall deliver to OWNER, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by OWNER or any other additional insured) which CONTRACTOR is required to purchase and maintain. OWNER shall deliver to CONTRACTOR, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by CONTRACTOR or any other additional insured) which OWNER is required to purchase and maintain.

5.04 *CONTRACTOR's Liability Insurance*

A. CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
2. claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;
3. claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;
4. claims for damages insured by reasonably available personal injury liability coverage which are sustained: (i) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR, or (ii) by any other person for any other reason;

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; and

6. 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 motor vehicle.

B. The policies of insurance so required by this paragraph 5.04 to be purchased and maintained shall:

1. with respect to insurance required by paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability) OWNER, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering CONTRACTOR's indemnity obligations under paragraphs 6.07, 6.11, and 6.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least thirty days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the CONTRACTOR pursuant to paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing, or replac

ing defective Work in accordance with paragraph 13.07; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment (and CONTRACTOR shall furnish OWNER and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to OWNER and any such additional insured of continuation of such insurance at final payment and one year thereafter).

5.05 *OWNER's Liability Insurance*

A. In addition to the insurance required to be provided by CONTRACTOR under paragraph 5.04, OWNER, at OWNER's option, may purchase and maintain at OWNER's expense OWNER's own liability insurance as will protect OWNER against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by OWNER prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by ENGINEER;

5. allow for partial utilization of the Work by OWNER;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR, and ENGINEER with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. OWNER shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.07.

D. OWNER shall not be responsible for purchasing and maintaining any property insurance specified in this paragraph 5.06 to protect the interests of CONTRACTOR, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by CONTRACTOR, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the

limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If CONTRACTOR requests in writing that other special insurance be included in the property insurance policies provided under paragraph 5.06, OWNER shall, if possible, include such insurance, and the cost thereof will be charged to CONTRACTOR by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the Site, OWNER shall in writing advise CONTRACTOR whether or not such other insurance has been procured by OWNER.

5.07 *Waiver of Rights*

A. OWNER and CONTRACTOR intend that all policies purchased in accordance with paragraph 5.06 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. OWNER and CONTRACTOR waive all rights against each other and their respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by OWNER as trustee or otherwise payable under any policy so issued.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by paragraph 5.06 will be adjusted with OWNER and made payable to OWNER as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.08.B. OWNER shall deposit in a separate account any money so

received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

B. OWNER as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to OWNER's exercise of this power. If such objection be made, OWNER as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, OWNER as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, OWNER as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either OWNER or CONTRACTOR has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by paragraph 2.05.C. OWNER and CONTRACTOR shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the Bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent Bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If OWNER finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated

thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. CONTRACTOR shall supervise, inspect, 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. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of OWNER or ENGINEER in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

B. At all times during the progress of the Work, CONTRACTOR shall assign a competent resident superintendent thereto 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 or received from the superintendent shall be binding on CONTRACTOR.

6.02 *Labor; Working Hours*

A. CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out, and construct the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday, or any legal holiday without OWNER's written consent (which will not be unreasonably withheld) given after prior written notice to ENGINEER.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the General Requirements, CONTRACTOR shall provide and assume full responsibility for all services, 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 performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of OWNER. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.07 as it may be adjusted from time to time as provided below.

1. CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.07) proposed adjustments in the progress schedule that will not result in changing the Contract Times (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of Article 12. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular

Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to ENGINEER for review under the circumstances described below.

1. *"Or-Equal" Items:* If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment ENGINEER determines that: (i) it is at least equal in quality, durability, appearance, strength, and design characteristics; (ii) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole, and;

b. CONTRACTOR certifies that: (i) there is no increase in cost to the OWNER; and (ii) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items

a. If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR.

c. The procedure for review by ENGINEER will be as set forth in paragraph 6.05.A.2.d, as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances.

d. CONTRACTOR shall first make written application to ENGINEER for review of a proposed substitute item of material or equipment that CONTRACTOR seeks to furnish or use. The application shall certify that the proposed substitute item will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified, and be suited to the same use as that specified. The application will state the extent, if any, to which the use of the proposed substitute item will prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not use of the proposed substitute item 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 work on the Project) to adapt the design to the proposed substitute item and whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute item from that specified will be identified in the application, and available engineering, sales, maintenance, repair, and replacement services will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change, all of which will be considered by ENGINEER in evaluating the proposed substitute item. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute item.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by ENGINEER. CONTRACTOR shall submit sufficient information to allow ENGINEER, in ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by

ENGINEER will be similar to that provided in subparagraph 6.05.A.2.

C. *Engineer's Evaluation:* ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.05.A and 6.05.B. ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized until ENGINEER's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." ENGINEER will advise CONTRACTOR in writing of any negative determination.

D. *Special Guarantee:* OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.

E. *ENGINEER's Cost Reimbursement:* ENGINEER will record time required by ENGINEER and ENGINEER's Consultants in evaluating substitute proposed or submitted by CONTRACTOR pursuant to paragraphs 6.05.A.2 and 6.05.B and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER approves a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's Consultants for evaluating each such proposed substitute.

F. *CONTRACTOR's Expense:* CONTRACTOR shall provide all data in support of any proposed substitute or "or-equal" at CONTRACTOR's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. CONTRACTOR shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to OWNER as indicated in paragraph 6.06.B), whether initially or as a replacement, against whom OWNER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to OWNER in advance for acceptance by OWNER by a specified date prior to the Effective Date of the Agreement, and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER's acceptance

(either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. CONTRACTOR shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by OWNER of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.

C. CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier or other individual or entity, nor shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR.

E. CONTRACTOR shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with ENGINEER through CONTRACTOR.

F. 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.

G. All Work performed for CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of

OWNER and ENGINEER. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.06, the agreement between the CONTRACTOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against OWNER, CONTRACTOR, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

6.07 *Patent Fees and Royalties*

A. 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 or ENGINEER 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. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees or agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to 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.

6.08 *Permits*

A. 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, or, if there are no Bids, on the Effective Date of the Agreement. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto, such as plant investment fees.

6.09 *Laws and Regulations*

A. CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

B. If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work may be the subject of an adjustment in Contract Price or Contract Times. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in paragraph 10.05.

6.10 *Taxes*

A. CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site

and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultant, and the officers, directors, partners, employees, agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against OWNER, ENGINEER, or any other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

B. Removal of Debris During Performance of the Work: During the progress of the Work CONTRACTOR shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. Cleaning: Prior to Substantial Completion of the Work CONTRACTOR shall clean the Site and make it ready for utilization by OWNER. At the completion of the Work CONTRACTOR shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. Loading Structures: CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. CONTRACTOR shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to ENGINEER for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to ENGINEER for OWNER.

6.13 *Safety and Protection*

A. 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, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

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

B. CONTRACTOR shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property 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 other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. All damage, injury, or loss to any property referred to in paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of OWNER or ENGINEER or ENGINEER's Consultant, or anyone employed by any of them, or anyone

for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and for 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 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. CONTRACTOR shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

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

6.17 *Shop Drawings and Samples*

A. CONTRACTOR shall submit Shop Drawings to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. All submittals will be identified as ENGINEER may require and in the number of copies specified in the General Requirements. 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 show ENGINEER the services, materials, and equipment CONTRACTOR

proposes to provide and to enable ENGINEER to review the information for the limited purposes required by paragraph 6.17.E.

B. CONTRACTOR shall also submit Samples to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers, and the use for which intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the limited purposes required by paragraph 6.17.E. The numbers of each Sample to be submitted will be as specified in the Specifications.

C. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER as required by paragraph 2.07, any related Work performed prior to ENGINEER's review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

D. *Submittal Procedures*

1. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto; and

d. CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to

CONTRACTOR's review and approval of that submittal.

3. At the time of each submittal, CONTRACTOR shall give ENGINEER specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to ENGINEER for review and approval of each such variation.

E. *ENGINEER's Review*

1. ENGINEER will timely review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER. ENGINEER's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. ENGINEER's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. 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 attention to each such variation at the time of each submittal as required by paragraph 6.17.D.3 and ENGINEER has given written approval of each such variation by 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 complying with the requirements of paragraph 6.17.D.1.

F. *Resubmittal Procedures*

1. 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 specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals.

6.18 *Continuing the Work*

A. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.04 or as OWNER and CONTRACTOR may otherwise agree in writing.

6.19 *CONTRACTOR's General Warranty and Guarantee*

A. CONTRACTOR warrants and guarantees to OWNER, ENGINEER, and ENGINEER's Consultants that all Work will be in accordance with the Contract Documents and will not be defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, Suppliers, or any other individual or entity for whom CONTRACTOR is responsible; or

2. normal wear and tear under normal usage.

B. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:

1. observations by ENGINEER;

2. recommendation by ENGINEER or payment by OWNER of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by ENGINEER or any payment related thereto by OWNER;

4. use or occupancy of the Work or any part thereof by OWNER;

5. any acceptance by OWNER or any failure to do so;

6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER;

7. any inspection, test, or approval by others; or

8. any correction of defective Work by OWNER.

6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage:

1. is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom; and

2. is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such individual or entity.

B. In any and all claims against OWNER or ENGINEER or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly

employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.20.A 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, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of CONTRACTOR under paragraph 6.20.A shall not extend to the liability of ENGINEER and ENGINEER's Consultants or to the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

ARTICLE 7 - OTHER WORK

7.01 *Related Work at Site*

A. OWNER may perform other work related to the Project at the Site by OWNER's employees, or let other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to CONTRACTOR prior to starting any such other work; and

2. if OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in paragraph 10.05.

B. CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (and OWNER, if OWNER is performing the other work with OWNER's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and

the execution of such other work and shall properly coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. CONTRACTOR shall not endanger any 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 others whose 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 direct contracts between OWNER and such utility owners and other contractors.

C. If the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to ENGINEER in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of CONTRACTOR's Work. CONTRACTOR's failure to so report will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If OWNER intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
2. the specific matters to be covered by such authority and responsibility will be itemized; and
3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, OWNER shall have sole authority and responsibility for such coordination.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.02 *Replacement of ENGINEER*

A. In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer to whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER.

8.03 *Furnish Data*

A. OWNER shall promptly furnish the data required of OWNER under the Contract Documents.

8.04 *Pay Promptly When Due*

A. OWNER shall make payments to CONTRACTOR promptly when they are due as provided in paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.01 and 4.05. Paragraph 4.02 refers to OWNER's identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by ENGINEER in preparing the Contract Documents.

8.06 *Insurance*

A. OWNER's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. OWNER is obligated to execute Change Orders as indicated in paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. OWNER's responsibility in respect to certain inspections, tests, and approvals is set forth in paragraph 13.03.B.

8.09 *Limitations on OWNER's Responsibilities*

A. The OWNER shall not supervise, direct, or have control or authority over, nor be responsible for, CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. OWNER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. OWNER's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. If and to the extent OWNER has agreed to furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract Documents, OWNER's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *OWNER'S Representative*

A. ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and will not be changed without written consent of OWNER and ENGINEER.

9.02 *Visits to Site*

A. ENGINEER will make visits to the Site at intervals appropriate to the various stages of construction as ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information

obtained during such visits and observations, ENGINEER, for the benefit of OWNER, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defective Work.

B. ENGINEER's visits and observations are subject to all the limitations on ENGINEER's authority and responsibility set forth in paragraph 9.10, and particularly, but without limitation, during or as a result of ENGINEER's visits or observations of CONTRACTOR's Work ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in providing more extensive observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9.10 and in the Supplementary Conditions. If OWNER designates another representative or agent to represent OWNER at the Site who is not ENGINEER's Consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Clarifications and Interpretations*

A. ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents as ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from the Contract Documents. Such written clarifications and interpretations will be binding on OWNER and CONTRACTOR. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a written

clarification or interpretation, a Claim may be made therefor as provided in paragraph 10.05.

9.05 *Authorized Variations in Work*

A. 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 Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER and also on CONTRACTOR, who shall perform the Work involved promptly. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of a Field Order, a Claim may be made therefor as provided in paragraph 10.05.

9.06 *Rejecting Defective Work*

A. ENGINEER will have authority to disapprove or reject Work which ENGINEER believes to be defective, or that ENGINEER believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER will also have authority to require special inspection or testing of the Work as provided in paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.07 *Shop Drawings, Change Orders and Payments*

A. In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraph 6.17.

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

C. In connection with ENGINEER's authority as to Applications for Payment, see Article 14.

9.08 *Determinations for Unit Price Work*

A. ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR the 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 decision thereon will be final and binding (except as modified by ENGINEER to reflect changed factual conditions or more accurate data)

upon OWNER and CONTRACTOR, subject to the provisions of paragraph 10.05.

9.09 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. ENGINEER will be the initial 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, the quantities and classifications of Unit Price Work, the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, and Claims seeking changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing, in accordance with the provisions of paragraph 10.05, with a request for a formal decision.

B. When functioning as interpreter and judge under this paragraph 9.09, ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to this paragraph 9.09 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 14.07) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such Claim, dispute, or other matter.

9.10 *Limitations on ENGINEER's Authority and Responsibilities*

A. Neither ENGINEER's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by ENGINEER shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. ENGINEER will not be responsible for CONTRACTOR's failure to

perform the Work in accordance with the Contract Documents.

C. ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. ENGINEER's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this paragraph 9.10 shall also apply to ENGINEER's Consultants, Resident Project Representative, and assistants.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. 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 by a Written Amendment, a Change Order, or a Work Change Directive. 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).

B. If OWNER and CONTRACTOR are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in paragraph 3.04, except in the case of an emergency as provided in

paragraph 6.16 or in the case of uncovering Work as provided in paragraph 13.04.B.

10.03 *Execution of Change Orders*

A. OWNER and CONTRACTOR shall execute appropriate Change Orders recommended by ENGINEER (or Written Amendments) covering:

1. changes in the Work which are: (i) ordered by OWNER pursuant to paragraph 10.01.A, (ii) required because of acceptance of defective Work under paragraph 13.08.A or OWNER's correction of defective Work under paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 10.05; 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 6.18.A.

10.04 *Notification to Surety*

A. 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 Times) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility. The amount of each applicable Bond will be adjusted to reflect the effect of any such change.

10.05 *Claims and Disputes*

A. *Notice:* Written notice stating the general nature of each Claim, dispute, or other matter shall be delivered by the claimant to ENGINEER and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. Notice of the amount or extent of the Claim, dispute, or other matter with supporting data shall be delivered to the ENGINEER and the other party to the Contract within 60 days after the start of such event (unless ENGINEER allows additional time

for claimant to submit additional or more accurate data in support of such Claim, dispute, or other matter). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to ENGINEER and the claimant within 30 days after receipt of the claimant's last submittal (unless ENGINEER allows additional time).

B. *ENGINEER's Decision:* ENGINEER will render a formal decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any. ENGINEER's written decision on such Claim, dispute, or other matter will be final and binding upon OWNER and CONTRACTOR unless:

1. an appeal from ENGINEER's decision is taken within the time limits and in accordance with the dispute resolution procedures set forth in Article 16; or

2. if no such dispute resolution procedures have been set forth in Article 16, a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within 30 days after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction within 60 days after the date of such decision or within 60 days after Substantial Completion, whichever is later (unless otherwise agreed in writing by OWNER and CONTRACTOR), to exercise such rights or remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable Laws and Regulations.

C. If ENGINEER does not render a formal decision in writing within the time stated in paragraph 10.05.B, a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

D. No Claim for an adjustment in Contract Price or Contract Times (or Milestones) will be valid if not submitted in accordance with this paragraph 10.05.

ARTICLE 11 - COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* 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. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to CONTRACTOR will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Such employees shall include without limitation superintendents, foremen, and other personnel employed full time at the Site. 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 fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by OWNER.

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 payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.

3. Payments made by CONTRACTOR to Subcontractors for Work performed by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to OWNER, who will then determine, with the advice of ENGINEER, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in this paragraph 11.01.

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.

5. Supplemental costs including the following:

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

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the 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.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the 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.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

e. Deposits lost 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 royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with paragraph 5.06.D), provided such losses and damages have resulted from causes other than the 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. Such losses shall include settlements made with the 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.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressage, and similar petty cash items in connection with the Work.

i. When the Cost of the Work is used to determine the value of a Change Order or of a Claim, the cost of premiums for additional Bonds and insurance required because of the changes in the Work or caused by the event giving rise to the Claim.

j. When all the Work is performed on the basis of cost-plus, the costs of premiums for all Bonds and insurance CONTRACTOR is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnerships 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 Site or in CONTRACTOR's princi

pal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.01.A.1 or specifically covered by paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the CONTRACTOR's fee.

2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site.

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

4. Costs due to the 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, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraphs 11.01.A and 11.01.B.

C. *CONTRACTOR's Fee:* When all the Work is performed on the basis of cost-plus, CONTRACTOR's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, CONTRACTOR's fee shall be determined as set forth in paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to paragraphs 11.01.A and 11.01.B, CONTRACTOR will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

11.02 *Cash Allowances*

A. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums as may be acceptable to OWNER and ENGINEER. CONTRACTOR agrees that:

1. the allowances include the cost to CONTRACTOR (less any applicable trade discounts) of

materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. CONTRACTOR's costs for unloading and handling on the Site, labor, installation costs, overhead, profit, and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

B. 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.

11.03 *Unit Price Work*

A. 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 unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER subject to the provisions of paragraph 9.08.

B. 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.

C. OWNER or CONTRACTOR may make a Claim for an adjustment in the Contract Price in accordance with paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect any other item of Work; and

3. if CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or OWNER believes that OWNER is entitled to a decrease in Contract Price and the

parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in paragraph 11.01) plus a CONTRACTOR's fee for overhead and profit (determined as provided in paragraph 12.01.C).

C. *CONTRACTOR's Fee:* The CONTRACTOR's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under paragraphs 11.01.A.1 and 11.01.A.2, the CONTRACTOR's fee shall be 15 percent;

b. for costs incurred under paragraph 11.01.A.3, the CONTRACTOR's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by CONTRACTOR to OWNER for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in CONTRACTOR's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times (or Milestones) may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Times (or Milestones) shall be based on written notice submitted by the party making the claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. Any adjustment of the Contract Times (or Milestones) covered by a Change Order or of any Claim for an adjustment in the Contract Times (or Milestones) will be determined in accordance with the provisions of this Article 12.

12.03 *Delays Beyond CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in paragraph 12.02.A. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

12.04 *Delays Within CONTRACTOR's Control*

A. The Contract Times (or Milestones) will not be extended due to delays within the control of CONTRACTOR. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.05 *Delays Beyond OWNER's and CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay.

12.06 *Delay Damages*

A. In no event shall OWNER or ENGINEER be liable to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from:

1. delays caused by or within the control of CONTRACTOR; or
2. delays beyond the control of both OWNER and CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

B. Nothing in this paragraph 12.06 bars a change in Contract Price pursuant to this Article 12 to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inactions of OWNER or anyone for whom OWNER is responsible.

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

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which OWNER or ENGINEER has actual knowledge will be given to CONTRACTOR. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. OWNER, ENGINEER, ENGINEER's Consultants, other representatives and personnel of OWNER, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. OWNER shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by paragraphs 13.03.C and 13.03.D below;
2. that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.04.B shall be paid as provided in said paragraph 13.04.B; and
3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining

such inspections, tests, or approvals, pay all costs in connection therewith, and furnish ENGINEER the required certificates of inspection or approval.

D. CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for OWNER's and ENGINEER's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to OWNER and ENGINEER.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by CONTRACTOR without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation.

F. Uncovering Work as provided in paragraph 13.03.E shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for ENGINEER's observation and replaced at CONTRACTOR's expense.

B. If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment. If it is found that such Work is defective, CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If, however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times

(or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

13.05 *OWNER May Stop the Work*

A. If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such 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, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. CONTRACTOR shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by ENGINEER, remove it from the Project and replace it with Work that is not defective. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion 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, or if the repair of any damages to the land or areas made available for CONTRACTOR's use by OWNER or permitted by Laws and Regulations as contemplated in paragraph 6.11.A is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions: (i) repair such defective land or areas, or (ii) correct such defective Work or, if the defective Work has been rejected by OWNER, remove it from the Project and replace it with Work that is not defective, and (iii) satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom. If CONTRACTOR does not promptly comply with the terms

of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or repaired or may have the rejected Work removed and replaced, and all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

B. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

C. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

D. CONTRACTOR's obligations under this paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, OWNER (and, prior to ENGINEER's recommendation of final payment, ENGINEER) prefers to accept it, OWNER may do so. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to OWNER's evaluation of and determination to accept such defective Work (such costs to be approved by ENGINEER as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by CONTRACTOR pursuant to this sentence. If any such acceptance occurs prior to ENGINEER's recommendation of final payment, 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, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in

paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

13.09 *OWNER May Correct Defective Work*

A. If CONTRACTOR fails within a reasonable time after written notice from ENGINEER to correct defective Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.06.A, 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 seven days written notice to CONTRACTOR, correct and remedy any such deficiency.

B. In exercising the rights and remedies under this paragraph, OWNER shall proceed expeditiously. In connection with such corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the Site, take possession of all or part of the Work and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees, OWNER's other contractors, and ENGINEER and ENGINEER's Consultants access to the Site to enable OWNER to exercise the rights and remedies under this paragraph.

C. All Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by OWNER in exercising the rights and remedies under this paragraph 13.09 will be charged against CONTRACTOR, 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. If the parties are unable to agree as to the amount of the adjustment, OWNER may make a Claim therefore as provided in paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of CONTRACTOR's defective Work.

D. CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the

exercise by OWNER of OWNER's rights and remedies under this paragraph 13.09.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The schedule of values established as provided in paragraph 2.07.A will serve as the basis for 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 completed.

14.02 *Progress Payments*

A. *Applications for Payments*

1. At least 20 days before the date established for each progress payment (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. 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 location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that OWNER has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect OWNER's interest therein, all of which must be satisfactory to OWNER.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of CONTRACTOR stating that all previous progress payments received on account of the Work have been applied on account to discharge CONTRACTOR's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications*

1. ENGINEER will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to OWNER or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application.

2. ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based on ENGINEER's observations on the Site of the executed Work as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules, that to the best of ENGINEER's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.08, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to CONTRACTOR's being entitled to such payment appear to have been fulfilled in so far as it is ENGINEER's responsibility to observe the Work.

3. By recommending any such payment ENGINEER will not thereby be deemed to have represented that: (i) inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents; or (ii) that there may not be other matters or issues between the parties that might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.

4. Neither ENGINEER's review of CONTRACTOR's Work for the purposes of recommending payments nor ENGINEER's recommendation of any payment, including final payment, will impose responsibility on ENGINEER to supervise, direct, or control the Work or for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for CONTRACTOR's failure to comply with Laws and Regulations applicable to CONTRACTOR's performance of the Work. Additionally, said review or recommendation will not impose responsibility on ENGINEER to make any examination to ascertain how or for what purposes CONTRACTOR has used the moneys paid on account of the Contract Price, or to determine that title to any of the Work, materials, or equipment has passed to OWNER free and clear of any Liens.

5. ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's opinion, it would be incorrect to make the representations to OWNER referred to in paragraph 14.02.B.2. ENGINEER may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Written Amendment or Change Orders;

c. OWNER has been required to correct defective Work or complete Work in accordance with paragraph 13.09; or

d. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraph 15.02.A.

C. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to OWNER with ENGINEER's recommendation, the amount recommended will (subject to the provisions of paragraph 14.02.D) become due, and when due will be paid by OWNER to CONTRACTOR.

D. *Reduction in Payment*

1. OWNER may refuse to make payment of the full amount recommended by ENGINEER because:

a. claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such Liens;

c. there are other items entitling OWNER to a set-off against the amount recommended; or

d. OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.02.B.5.a through 14.02.B.5.c or paragraph 15.02.A.

2. If OWNER refuses to make payment of the full amount recommended by ENGINEER, OWNER must give CONTRACTOR immediate written notice (with a copy to ENGINEER) stating the reasons for such action and promptly pay CONTRACTOR any amount remaining after deduction of the amount so withheld. OWNER shall promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER's satisfaction the reasons for such action.

3. If it is subsequently determined that OWNER's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by paragraph 14.02.C.1.

14.03 *CONTRACTOR's Warranty of Title*

A. CONTRACTOR warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically

listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Promptly thereafter, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor. 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 items to be completed or corrected before final payment. OWNER shall have seven 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 14 days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefor. If, after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within said 14 days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as ENGINEER believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER in writing prior to ENGINEER's issuing the definitive certificate of Substantial Completion, ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

B. OWNER shall have the right to exclude CONTRACTOR from the Site after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Use by OWNER at OWNER's option of any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which OWNER, ENGINEER, and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER for its intended purpose

without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following conditions.

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 its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to OWNER and ENGINEER that such part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify OWNER and ENGINEER in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

2. No occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

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

14.07 *Final Payment*

A. *Application for Payment*

1. After CONTRACTOR has, in the opinion of ENGINEER, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in paragraph 6.12), and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by subparagraph 5.04.B.7; (ii) consent of the surety, if any, to final payment; and (iii) complete and legally effective releases or waivers (satisfactory to OWNER) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in paragraph 14.07.A.2 and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full and an affidavit of CONTRACTOR that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which OWNER or OWNER's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

B. *Review of Application and Acceptance*

1. 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 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 ten days after receipt of the

final Application for Payment, indicate in writing ENGINEER's recommendation of payment and present the Application for Payment to OWNER for payment. At the same time ENGINEER will also give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.09. Otherwise, ENGINEER will return the Application for Payment to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due*

1. Thirty days after the presentation to OWNER of the Application for Payment and accompanying documentation, the amount recommended by ENGINEER will become due and, when due, will be paid by OWNER to CONTRACTOR.

14.08 *Final Completion Delayed*

A. 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 5.01, the written consent of the surety to the 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 payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by OWNER against CONTRACTOR, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's

continuing obligations under the Contract Documents; and

2. a waiver of all Claims by CONTRACTOR against OWNER other than those previously made in writing which are still unsettled.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 *OWNER May Suspend Work*

A. At any time and without cause, OWNER may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by 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 shall be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if CONTRACTOR makes a Claim therefor as provided in paragraph 10.05.

15.02 *OWNER May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. CONTRACTOR's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.07 as adjusted from time to time pursuant to paragraph 6.04);

2. CONTRACTOR's disregard of Laws or Regulations of any public body having jurisdiction;

3. CONTRACTOR's disregard of the authority of ENGINEER; or

4. CONTRACTOR's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in paragraph 15.02.A occur, OWNER may, after giving CONTRACTOR (and the surety, if any) seven days written notice, terminate the services of CONTRACTOR, exclude CONTRACTOR from the Site, and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment, and machinery at the Site, and use the

same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, 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 all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by OWNER arising out of or relating to completing the Work, such excess will be paid to CONTRACTOR. If such claims, costs, losses, and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses, and damages incurred by OWNER will be reviewed by ENGINEER as to their reasonableness and, when so approved by ENGINEER, incorporated in a Change Order. When exercising any rights or remedies under this paragraph OWNER shall not be required to obtain the lowest price for the Work performed.

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

15.03 *OWNER May Terminate For Convenience*

A. Upon seven days written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the Contract. In such case, CONTRACTOR shall be paid (without duplication of any items):

1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. for all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. for reasonable expenses directly attributable to termination.

B. CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

C. CONTRACTOR shall take all reasonable steps to reduce his costs related to termination and shall not incur additional costs once written notice of cancellation is cancelled.

15.04 *CONTRACTOR May Stop Work or Terminate*

A. If, through no act or fault of CONTRACTOR, the Work is suspended for more than 90 consecutive days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within 30 days after it is submitted, or OWNER fails for 30 days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven days written notice to OWNER and ENGINEER, and provided OWNER or ENGINEER do not remedy such suspension or failure within that time, terminate the Contract and recover from OWNER payment on the same terms as provided in paragraph 15.03. In lieu of terminating the Contract and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within 30 days after it is submitted, or OWNER has failed for 30 days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may, seven days after written notice to OWNER and ENGINEER, stop the Work until payment is made of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.04 are not intended to preclude CONTRACTOR from making a Claim under paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping the Work as permitted by this paragraph.

ARTICLE 16 - DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Dispute resolution methods and procedures, if any, shall be as set forth in the Supplementary Conditions. If no method and procedure has been set forth, and subject to the provisions of paragraphs 9.09 and 10.05, OWNER and CONTRACTOR may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

ARTICLE 17 - MISCELLANEOUS

17.01 *Giving Notice*

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

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Agreement.

17.05 *Controlling Law*

A. This Contract is to be governed by the laws of the State of Texas and venue shall be Bell County.

**CITY OF KILLEEN
SUPPLEMENTAL GENERAL CONDITIONS**

The following items shall be a part of the contract as supplemental conditions:

A. Insurance

The Contractor shall carry insurance in the following types and amounts for the duration of the Contract, which shall include items owned by the City in care, custody, and control of the Contractor prior and during construction and warranty period and furnish Certificates of Insurance on the forms provided as evidence thereof. Copies of policy declaration pages and all policy endorsements to be furnished upon request.

1. Worker's Compensation Insurance Coverage.

a. Definitions:

Certificate of coverage ("certificate") - A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory worker's compensation insurance coverage for the person's or entity's employees providing services in a project, for the duration of the project.

Duration of the project - includes the time from the beginning of the work on the project until the Contractor's/person's work on the project has been completed and accepted by the City.

Persons providing services on the project ("subcontractor" in Section 406.096, Texas Labor Code) - includes all persons or entities performing all or part of the services the Contractor has undertaken to perform on the 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, owners-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

- 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, Section 401.011(44) for all employees of the Contractor providing services on the project, for the duration of the project.
- c.** The Contractor must provide a certificate of coverage to the City 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 the project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the City showing that coverage has been extended.
- e.** The Contractor shall obtain from each person providing services on a project, and provide to the City:

 - (1) a certificate of coverage, prior to that person beginning work on the project, so the City will have on file certificates of coverage showing coverage for all persons providing services on the project; and
 - (2) no later than seven 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 the project.

- f. The Contractor shall retain all required certificates of coverage for the duration of the project and for one year thereafter.
- g. The Contractor shall notify the City in writing by certified mail or personal delivery, within 10 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 the project.
- h. The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the 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 a 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 Section 401.011(44) for all of its employees' providing services on the project, for the duration of the project;
 - (2) provide to the Contractor, prior to that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the 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 the 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 the 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 the project;
 - (5) retain all required certificates of coverage on file for the duration of the project and for one year thereafter;
 - (6) notify the City, in writing, by certified mail or personal delivery, within 10 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 the project;
 - (7) contractually require each person with whom it contracts, to perform as required by paragraphs (1) - (7), 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 who will provide services on the project will be covered by workers; compensation coverage for the duration of the 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 appropriate insurance carrier or, in case of a self-insured, with the commission's Division of Self-Insurance Regulation. 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 City to declare the contract void if the Contractor does not remedy the breach within ten days after receipt of notice of breach from the City.
2. Commercial General Liability Insurance with minimum limits of:
- | | |
|---|-------------|
| General Aggregate | \$1,000,000 |
| Products & Completed Operations | 1,000,000 |
| Aggregate | 500,000 |
| Personal & Advertising Injury Each Occurrence | 500,000 |
| Fire Damage (Any One Fire) | 50,000 |
| Medical Expense (Any One Person) | 1,000 |
3. City's and Contractor's protective liability insurance policy naming the City of Killeen as insured. Coverage shall be on an "occurrence" basis, and the policy shall be issued by the same insurance company that carries the Contractor's liability insurance. Minimum limits of liability shall be as follows:
- | | |
|----------------|-------------|
| Per Occurrence | \$1,000,000 |
| Aggregate | 500,000 |
4. Automobile Liability Insurance for all owned, non-owned and hired vehicles with minimum limits for Bodily Injury of \$250,000 for each person and \$500,000 for each occurrence and Property Damage limits of \$100,000 or a Combined Single Limit of \$600,000.
5. On all new or remodeling building projects; All Risk Builders Risk Insurance for insurable building projects shall be insured in the amount of the contract price for such improvements. The City and Contractor waive all rights against each other for damages caused by fire or other perils to the extent covered by Builders Risk Insurance required under this section, except as to such rights as they may have in the proceeds of such insurance. Contractor shall require similar waivers by Subcontractors and Sub-subcontractors.

If insurance policies are not written for amount specified in 2 and 3 above, Contractor is required to carry an Excess Liability Insurance Policy for any difference in amounts specified.

Contractor shall be responsible for deductibles and self-insured retentions, if any, stated in policies. Any self-insured retention shall not exceed ten percent (10%) of minimum required limits. All deductibles or self-insured retentions shall be disclosed on Certificate of Insurance required above.

Contractor shall not commence work at site under this Contract until he has obtained required insurance and until such insurance has been reviewed by the City's Project Manager. Contractor shall not allow any Subcontractors to commence work until insurance required has been obtained and approved. Approval of insurance by the City shall not relieve or decrease liability of Contractor hereunder.

Insurance to be written by a company licensed to do business in the State of Texas at the time policy is issued and acceptable to the City.

Contractor shall produce an endorsement to each affected policy:

1. Naming City of Killeen, P.O. Box 1329, Killeen, Texas 76540, as additional insured (except Workers' Compensation and Builders Risk).
2. To provide a waiver of subrogation to the City of Killeen.
3. That obligates the insurance company to notify the Project Manager, City of Killeen, P.O. Box 1329, Killeen, Texas 76540, that no policies will be cancelled or reduced, restricted, or limited until thirty (30) days after the City has received written notice as evidenced by return receipt of registered or certified letter.

4. That the "other" insurance clause shall not apply to the City where City of Killeen is an additional insured shown on policy. It is intended that policies required in this agreement, covering both the City and Contractor, shall be considered primary coverage as applicable.

Contractor shall not cause any insurance to be canceled nor permit any insurance to lapse during term of this Contract or as required in the Contract.

If Contractor is underwritten on a claim-made basis, the retroactive date shall be prior to, or coincident with, the date of this Contract and the Certificate of Insurance shall state that coverage is claims made and also the retroactive date. Contractor shall maintain coverage for duration of this Contract. Contractor shall provide the City annually a Certificate of Insurance as evidenced of such insurance. It is further agreed that Contractor shall provide the City a 30-day notice of aggregate erosion, an advance of the retroactive date, cancellation and/or renewal.

It is also agreed that Contractor will invoke the tail option at request of the City and that Extended Reporting Period (ERP) premium shall be paid by the Contractor.

The City reserves the right to review and renegotiate the insurance requirements of this section during effective period of the Contract and to make reasonable adjustments to insurance coverages and their limits when deemed necessary and prudent by the City based upon changes in statutory law, court decisions or the claims history of the industry as well as Contractor.

The City shall be entitled, upon request, and without expense, to receive copies of policies and all endorsement thereto and may make any reasonable requests for deletion or revision or modification of particular policy terms, conditions, limitations, or exclusions, except where policy provisions are established by law or regulation binding upon either of the parties hereto or the underwriter on any of such policies.

Actual losses not covered by insurance as required by this section shall be paid by Contractor.

B. Performance and Payment Bonds

If the bid amount is less than \$25,000, the bidder is not required to provide Performance and Payment Bonds. Payment for the Project will be made by the City of Killeen only upon completion and acceptance of the work on the Project by the City of Killeen.

If the bid amount exceeds \$25,000, the City of Killeen will require 100% Performance and Payment Bonds for the Project.

If the Performance and Payment Bonds are to be provided, the successful bidder must furnish the bonds from a surety company authorized to do business in the State of Texas and appearing on the U.S. Treasury list. Such bonds must be on the forms provided by the City of Killeen in the amount of one hundred percent (100%) of the contract price, conditioned that the Contractor will faithfully perform the contract executed, in accordance with Article 2253, Government Code.

C. Liquidated Damages

Each bidder must submit his bid with the distinct understanding that, in case of its acceptance, time for completion shall be considered the essence of the Agreement; and that the expense entailed by the City by delayed completion of the work covered by this Agreement within the time stipulated therein shall entitle the City to a fixed sum of \$ _____ per day as liquidated damages for each and every calendar day's delay not caused by the City or its contractors, provided, however, that the collection of any or all of the said money may be waived at the discretion of the City.

D. Wages

Contractor and subcontractors shall comply with Government Code Chapter 2258, as amended, in performing this

project. In accordance with Chapter 2258, as amended, the prevailing wage rates as set forth in the Contract Documents shall be paid on this project. For overtime work and legal holidays, the hourly rate shall be one and one-half times the basic hourly rate set forth in the schedule of prevailing wage rates, which is incorporated herein for all purposes. The City may require an affidavit stating that the Contractor has complied with the prevailing wage rate provision of the Contract Documents prior to acceptance of the project or at any time during or after completion of the Contract.

The City reserves the right to conduct interviews with the Contractor's and subcontractors' employees to ensure compliance with V.T.C.A. Government Code Chapter 2258, as amended and with all applicable local, state, and federal laws. Upon written request by City, the General Contractor shall be responsible for submitting payroll information to the City for all employees performing work on the project, whether employed by the General Contractor or a subcontractor. Each submittal shall be certified by the General Contractor as to completeness and accuracy.

A Contractor or subcontractor in violation of Chapter 2258 of the Texas Government Code, as amended, is liable for a penalty. That Contractor or subcontractor shall pay to the City Sixty and 00/100 Dollars (\$60.00) for each laborer, worker, or mechanic employed for each calendar day, or portion thereof, that such laborer, worker, or mechanic is paid less than the prevailing wage rates specified herein for Work done under this Contract. Nothing herein shall preclude the Contractor or subcontractor from paying higher wages than specified herein.

A Contractor or subcontractor violating a requirement of this Paragraph may be determined ineligible to bid on or receive any additional work during the calendar year following the year in which the violation occurred.

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"General Decision Number: TX20240007 01/05/2024

Superseded General Decision Number: TX20230007

State: Texas

Construction Types: Heavy and Highway

Counties: Atascosa, Bandera, Bastrop, Bell, Bexar, Brazos, Burleson, Caldwell, Comal, Coryell, Guadalupe, Hays, Kendall, Lampasas, McLennan, Medina, Robertson, Travis, Williamson and Wilson Counties in Texas.

HEAVY (excluding tunnels and dams, not to be used for work on Sewage or Water Treatment Plants or Lift / Pump Stations in Bell, Coryell, McClennon and Williamson Counties) and 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)(1).

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 \$17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.
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 \$12.90 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 2024.

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 01/05/2024

SUTX2011-006 08/03/2011

Rates Fringes

CEMENT MASON/CONCRETE
FINISHER (Paving and
Structures).....\$ 12.56 **

ELECTRICIAN.....\$ 26.35

FORM BUILDER/FORM SETTER
Paving & Curb.....\$ 12.94 **
Structures.....\$ 12.87 **

LABORER
Asphalt Raker.....\$ 12.12 **
Flagger.....\$ 9.45 **
Laborer, Common.....\$ 10.50 **
Laborer, Utility.....\$ 12.27 **
Pipelayer.....\$ 12.79 **
Work Zone Barricade
Servicer.....\$ 11.85 **

PAINTER (Structures).....\$ 18.34

POWER EQUIPMENT OPERATOR:
Agricultural Tractor.....\$ 12.69 **
Asphalt Distributor.....\$ 15.55 **
Asphalt Paving Machine.....\$ 14.36 **
Boom Truck.....\$ 18.36
Broom or Sweeper.....\$ 11.04 **
Concrete Pavement
Finishing Machine.....\$ 15.48 **
Crane, Hydraulic 80 tons
or less.....\$ 18.36
Crane, Lattice Boom 80
tons or less.....\$ 15.87 **
Crane, Lattice Boom over
80 tons.....\$ 19.38
Crawler Tractor.....\$ 15.67 **
Directional Drilling
Locator.....\$ 11.67 **
Directional Drilling
Operator.....\$ 17.24
Excavator 50,000 lbs or
Less.....\$ 12.88 **
Excavator over 50,000 lbs...\$ 17.71
Foundation Drill, Truck
Mounted.....\$ 16.93 **
Front End Loader, 3 CY or
Less.....\$ 13.04 **
Front End Loader, Over 3 CY.\$ 13.21 **
Loader/Backhoe.....\$ 14.12 **
Mechanic.....\$ 17.10 **
Milling Machine.....\$ 14.18 **
Motor Grader, Fine Grade....\$ 18.51
Motor Grader, Rough.....\$ 14.63 **
Pavement Marking Machine....\$ 19.17
Reclaimer/Pulverizer.....\$ 12.88 **

Roller, Asphalt.....\$ 12.78 **
 Roller, Other.....\$ 10.50 **
 Scraper.....\$ 12.27 **
 Spreader Box.....\$ 14.04 **
 Trenching Machine, Heavy....\$ 18.48

Servicer.....\$ 14.51 **

Steel Worker

Reinforcing.....\$ 14.00 **
 Structural.....\$ 19.29

TRAFFIC SIGNALIZATION:

Traffic Signal Installation

Traffic Signal/Light Pole
 Worker.....\$ 16.00 **

TRUCK DRIVER

Lowboy-Float.....\$ 15.66 **
 Off Road Hauler.....\$ 11.88 **
 Single Axle.....\$ 11.79 **
 Single or Tandem Axle Dump
 Truck.....\$ 11.68 **
 Tandem Axle Tractor w/Semi
 Trailer.....\$ 12.81 **

WELDER.....\$ 15.97 **

 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 (\$17.20) or 13658
 (\$12.90). Please see the Note at the top of the wage
 determination for more information. Please also note that the
 minimum wage requirements of Executive Order 14026 are not
 currently being enforced as to any contract or subcontract to
 which the states of Texas, Louisiana, or Mississippi, including
 their agencies, are a party.

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) (iii)).

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.

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END OF GENERAL DECISION"

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

OFFICE USE ONLY

Complete Nos. 1 - 4 and 6 if there are interested parties.
Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.

4 Name of Interested Party	City, State, Country (place of business)	Nature of Interest (check applicable)	
		Controlling	Intermediary

5 Check only if there is NO Interested Party. ☐

6 UNSWORN DECLARATION

My name is _____, and my date of birth is _____.

My address is _____, _____, _____, _____, _____.
(street) (city) (state) (zip code) (country)

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

Executed in _____ County, State of _____, on the _____ day of _____, 20____.
(month) (year)

Signature of authorized agent of contracting business entity
(Declarant)

ADD ADDITIONAL PAGES AS NECESSARY

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Contract Verification

Texas law provides that a governmental entity may not enter into certain contracts for goods and services with a company unless the company provides written verification regarding aspects of the company's business dealings.

- Texas Government Code, Chapter 2271 – the company must verify that it does not boycott Israel and will not boycott Israel during the term of the contract. *Boycott Israel is defined in Government Code Chapter 808.*
- Texas Government Code, Chapter 2274 – the company must verify that it does not boycott energy companies and will not boycott energy companies during the term of the contract. *Boycott energy company is defined in Government Code Chapter 809.*
- Texas Government Code, Chapter 2274 – the company must verify that it does not have a practice, policy, guidance or directive that discriminates against a firearm entity or firearm trade association and will not discriminate during the term of the contract against a firearm entity or firearm trade association. Verification is not required from a sole source provider. *Discriminate, firearm entity and firearm trade association are defined in Government Code Chapter 2274.*

Affected by the above statutes are contracts 1) with a company with ten (10) or more full-time employees, and 2) valued at \$100,000 or more to be paid wholly or partly from public funds. A contract with a sole proprietorship is not included.

By signing below, I verify that the company listed below does not boycott Israel, does not boycott energy companies and does not discriminate against firearms entities or firearm trade associations and will not do so during the term of the contract entered into with the City of Killeen. I further certify that I am authorized by the company listed below to make this verification.

Signature

Company Name

Printed Name

Title

Date

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ACORD TM CERTIFICATE OF LIABILITY INSURANCE		DATE _____
PRODUCER _____	THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES B ELOW.	
INSURERS AFFORDING COVERAGE		
INSURED _____	INSURER A: _____ INSURER B: _____ INSURER C: _____ INSURER D: _____ INSURER E: _____	

COVERAGES

THE POLOCIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POL ICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
	GENERAL LIABILITY ☐ COMMERCIAL GENERAL LIABILITY ☐ ☐ CLAIMS MADE ☐ OCCUR ☐ PREMISES/OPERATION ☐ _____ GENL AGGREGATE LIMIT APPLIES PER ☐ POLICY ☐ PROJECT ☐ LOC				EACH OCCURANCE	\$
					FIRE DAMAGE (Any one fire)	\$
					MED EXP (Any one person)	\$
					PERSONAL & ADV INJURY	\$
					GENERAL AGGREGATE	\$
					PRODUCTS – COMP/OP AGG	\$
	AUTOMOBILE LIABILITY ☐ ANY AUTO ☐ ALL OWNED AUTOS ☐ SCHEDULED AUTOS ☐ HIRED AUTOS ☐ NPN-OWNED AUTOS ☐ _____ ☐				COMBINED SINGLE LIMIT (Ea accident)	\$
					BODILY INJURY (Per person)	\$
					BODILY INJURY (Per accident)	\$
					PROPERTY DAMAGE (Per accident)	\$
	GARAGE LIABILITY ☐ ANY AUTO ☐				AUTO ONLY EA ACCIDENT	\$
					OTHER THAN AUTO ONLY	EA ACC AGG \$
	EXCESS LIABILITY ☐ OCCUR ☐ CLAIMS MADE ☐ DEDUCTIBLE ☐ RETENTION \$				EACH OCCURANCE	\$
					AGGREGATE	\$
						\$
						\$
						\$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY				WC STATU- TORY LIMITS	OTH -ER
					E.L.EACH ACCIDENT	\$
					E.L.DISEASE – EA EMPLOYEE	\$
					E.L.DISEASE- POLICY LIMIT	\$
	OTHER					

DESCRIPTION OF OPERTAIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS

Certificate of Insurance is issued as evidence of coverage.

CERTIFICATE HOLDER ADDITIONAL INSURED: INSURER LETTER: _____	CANCELATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURED WILL ENDEAVOR TO MAIL _____ DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.
AUTHORIZED REPRESENTATIVE _____	

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NOTICE OF AWARD

Dated: **TBD**

TO: **TBD**

(BIDDER)

ADDRESS: **TBD**

TBD

Project: Airport Pump Station Update

OWNER's Contract No. Bid No. 24-35

You are notified that your Bid dated Month Day, Year, for the above Contract has been considered. You are the apparent Successful Bidder and have been awarded a Contract for Installation on

Construction of 100,000 gallon stand pipe storage tank with associated pipe, valves, and mixer. Work also includes all electrical upgrades associated with the project.

(Indicate total Work, alternates or sections or Work awarded)

The Contract Price of your Contract is _____ Dollars (\$**X,XXX.XX**).

2 copies of each of the proposed Contract Documents accompany this Notice of Award.

You must comply with the following conditions precedent:

1. Within fifteen (15) days of the date of this Notice of Award; that is, by:
 - Deliver to the ENGINEER 2 fully executed counterparts of the Contract Documents. (Each of the Contract Documents must bear your signature on every appropriate page.)
 - Deliver with the executed Contract Documents the Contract Security (Bonds) as specified in the Instructions to Bidders (Article 20), General Conditions (paragraph 5.01) and Supplementary Conditions (paragraph SC-5.01).
 - Deliver with the executed Contract Documents and Contract Security (Bonds) a Certificate of Insurance that complies with the Supplementary Conditions (paragraph SC-5.03).
 - (List other conditions precedent).

2. By the Pre-Construction Meeting on _____:

3. Prior to Construction:

- SWPPP (approximately a 30-day process to approve)

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

Within ten days after you comply with the above conditions, OWNER will return to you one fully executed counterpart of the Contract Document.

(OWNER)

By:

(AUTHORIZED SIGNATURE)

(TITLE)

Copy to ENGINEER

Month ##, 2024

Mr. First Last Name
Title
ABC Co., Inc.
P.O. Box 1234
Temple, TX 76503

Reference: Notice to Proceed – Airport Pump Station Update

Dear Mr. Name:

ABC Construction Co., Inc. is hereby given Notice to Proceed for the work detailed in the Special Events Center Project. The Notice to Proceed is effective on Month ##, 2024 and the Contract time shall begin on Month ##, 2024. Substantial completion of the Contract should be done by Month ##, 2024.

We look forward to working with your firm in completing this project.

Sincerely,

Kent Cagle
City Manager

The above Notice to Proceed received this _____ day of _____, 2024.

ABC Co., Inc.

Typed Name and Title

cc: Steve Kana – Assistant City Engineer, City of Killeen

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APPLICATION FOR PAYMENT FORM

Contractor's Application for Payment No.

Contract Time: _____ Days

Project No.: _____

Elapsed Time: _____ Days

Period: _____

To: _____

Project Name: _____

Engineer: _____

Owner: _____

Contractor: _____

1.	Original Contract Amount.....	\$	-
2.	Owners Change Orders Thru No. 0	\$	-
3.	Total Current Contract Amount	\$	-
4.	Total Completed To Date	\$	-
5.	Total Materials Stored To Date	\$	-
6.	Total Completed And Stored To Date	\$	-
7.	Retainage (5% Of Line 6)	\$	-
8.	Total Completed, Less Retainage	\$	-
9.	Less Amount Of Previous Estimates	\$	-
10.	<u>Amount Due This Application</u>	\$	-

11. Balance To Finish, Plus Retainage (Line 3 - Line 6)

\$

12. Percent Completed To Date (Line 6 : Line 3)

\$

Contractor's Certification

The undersigned Contractor certifies that to the best of its knowledge: (1) all previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with Work covered by prior Applications for Payment; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to Owner at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to Owner indemnifying Owner against any such Liens, security interest or encumbrances); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

By: _____

Date: _____

Payment of: _____

\$

(Line 10 or other - attach explanation of the other amount)

Inspector's Approval of Quantities

Reviewed and Checked by: _____

(Name)

(Date)

Recommended by: _____

(Engineer)

(Date)

Payment of: _____

\$

(Line 10 or other - attach explanation of the other amount)

is approved by: _____

(Owner)

(Date)

3/16/2010

Project No:

Application for Payment

00 62 76 - 1

SECTION 00 62 11

SUBMITTAL/SHOP DRAWING SUBMITTAL

ENGINEER:		CONTRACTOR:		PROJECT #: 24-35		Date:	
KSA Engineers, Inc.				PW No: KIL014			
				Project Name:		Submittal No.:	
				Airport Pump Station Update		Re-Submittal No.:	
Item No.	Description of Item Submitted	MFG. or Contr Cat. Curve Drawing	No. Copies	Specification Section No.	Drawing Sheet	Engineer's Action Code	
(1) Reviewed (2) Provide as Noted (3) Provide as Noted/Confirmed Approval is only for general conformance of the design concept of the Project. Approval does not relieve the contractor of the responsibility for full compliance with the Contract Documents or constitute approval of any deviations unless those deviations are expressly listed at the beginning of the submittal and approved in writing by the Engineer. Contractor is responsible for dimensional conformation and correlation at the job site and for coordination of all trades. KSA Engineers, Inc. Date_____By:_____		(4) Provide as Noted/Resubmit (5) Not Approved (6) Comments Attached		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." Signature: _____			

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CHANGE ORDER FORM

Change Order No. _____

Date of Issuance: _____ Effective Date: _____

Project Name:	Owner's Contract No.:
Owner:	Date of Contract:
Contractor:	Project No.:

You are directed to make the following changes in the Contract Documents:

Description:

Reason for Change Order:

Attachments (list documents supporting change):

CHANGE IN CONTRACT PRICE:

Original Contract Price:
\$ _____
[Increase] [Decrease] from previously approved Change Orders No. _____ to No. _____:
\$ _____
Contract Price prior to this Change Order:
\$ _____
Increase of this Change Order:
\$ _____
Contract Price incorporating this Change Order:
\$ _____

CHANGE IN CONTRACT TIMES:

Original Contract Times: ☐ Working days ☐ Calendar days
Substantial completion (days): _____
Ready for final payment (days): _____
[Increase] [Decrease] from previously approved Change Orders No. _____ to No. _____:
Substantial completion (days): _____
Ready for final payment (days): _____
Contract Times prior to this Change Order:
Substantial completion (days): _____
Ready for final payment (days): _____
[Increase] [Decrease] of this Change Order:
Substantial completion (days): _____
Ready for final payment (days): _____
Contract Times with all approved Change Orders:
Substantial completion (days): _____
Ready for final payment (days): _____

RECOMMENDED:	ACCEPTED:	ACCEPTED:
By: _____	By: _____	By: _____
Engineer (Authorized Signature)	Owner (Authorized Signature)	Contractor (Authorized Signature)
Date: _____	Date: _____	Date: _____

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PROJ NO.: _____

PROJECT: _____

COUNTY: _____

**REQUEST FOR PAYMENT OF MATERIALS ON HAND
SUMMARY PAGE**

Sheet Totals		Amount
Sheet _____ of _____		
Sheet _____ of _____		
Sheet _____ of _____		
Sheet _____ of _____		
Sheet _____ of _____		
Sheet _____ of _____		
Sheet _____ of _____		
Sheet _____ of _____		
Sheet _____ of _____		
Sheet _____ of _____		
Total Value:		0.00
Less Previous Total Value:		
Net Change This Estimate:		0.00

1. Materials are non-perishable and suitable for incorporation into the work.
2. All materials are stored properly to prevent deterioration, contamination or intermingling of stockpiles.
3. Paid invoices are available for review for any materials that have been presented for payment.
4. All materials are identified and set apart for this project and have not been included in a request for payment on any other City of Killeen (COK) project.
5. The signatory hereby warrants that they have the authority to execute this request.

I certify that the quantities and values shown on this request for payment are true and correct. The materials are stored on the project site, or in a COK approved location(s), and meet all requirements of the contract.

Contractor

Name (Print or Type)

Title

Signature

Date

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PROJ NO.: _____
PROJECT: _____
COUNTY: _____

REQUEST FOR PAYMENT OF MATERIAL ON HAND

CONTRACTOR _____

Estimate Period From _____ To _____

Item and Description Number (0000-0000)	Material Description and Location	Unit of Meas	Received This Period	Previous Quantity On Hand	Used This Period	Balance On Hand	Unit Price \$	Total Installed to Date	Plan Qty	Total Value \$
						0.0000				0.0000
Grand Total						0.00	Sheet Total 0.00			

"By submitting a request for Material on Hand (MOH) payment, the Contractor expressly authorizes the City of Killeen (COK) to audit MOH records, and to perform process reviews of the record-keeping system. If the COK determines noncompliance with any of the requirements of the contract, the COK may exclude payment for any or all MOH for the duration of the Contract".

Signature of Contractor Authorized Representative: _____ Date: _____

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CERTIFICATE OF SUBSTANTIAL COMPLETION

DATE OF ISSUANCE _____

OWNER _____

CONTRACTOR _____

Contract: Airport Pump Station Update

Project: _____

OWNER's Contract No. 24-35 ENGINEER's Project No. KIL014

This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

To _____

OWNER

And To _____

CONTRACTOR

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

DATE OF SUBSTANTIAL COMPLETION

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR within _____ days of the above date of Substantial Completion.

EJCDC No. 1910-8-D (1996 Edition)

Prepared by the Engineers' Joint Contract Documents Committee and endorsed by The Associated General Contractors of America and the Construction Specifications Institute.

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties and guarantees shall be as follows:

OWNER: _____

CONTRACTOR: _____

The following documents are attached to and made a part of this Certificate:

[For items to be attached see definition of Substantial Completion as supplemented and other specifically noted conditions precedent to achieving Substantial Completion as required by Contract Documents.]

This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of CONTRACTOR's obligation to complete the Work in accordance with the Contract Documents.

Executed by ENGINEER on _____
Date

ENGINEER

By: _____
(Authorized Signature)

CONTRACTOR accepts this Certificate of Substantial Completion on _____
Date

CONTRACTOR

By: _____
(Authorized Signature)

OWNER accepts this Certificate of Substantial Completion on _____
Date

OWNER

By: _____
(Authorized Signature)

CERTIFICATE OF CONSTRUCTION COMPLETION

Date: _____		
Project Name:	Airport Pump Station Update	
Owner:	City of Killeen	Owner's Contract No.: 24-35
Contract:	Project No.: KIL014	
Bidder:		
Date Contract was Entered Into: _____		

This is to certify that all construction has been completed and a final inspection of the project was conducted on the **XXX** day of **XXX**, 20**XXX**

This is to further certify that:

1. The work has been completed in accordance with the plans and specifications and all addenda, change orders and supplemental agreements thereto, with the following exceptions: **XXX**
2. The sum of **XXX** (\$**XXX**) is deducted from the final payment to the contractor as a fair and equitable settlement for the foregoing excepted work.
3. The contractor has presented in behalf of itself and its sureties, satisfactory evidence that it is bound to repair, replace and make good any faulty workmanship and/or materials discovered in the work within a period of **XXX** months from this date, as provided in the contract.
4. The final payment in the amount below is now due and payable.

Amount of Original Contract	\$ _____
Cumulative Change Orders	\$ _____
Final Amount of Contract	\$ _____
Less Previous Payments	\$ _____
Less Deductions (from #2 above)	\$ _____
FINAL PAYMENT (Balance)	\$ _____

Signed By: _____

Contractor: _____	Date: _____
Engineer: _____	Date: _____
City: _____	Date: _____

END OF SECTION

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SECTION ###
CONTRACTOR'S AS-BUILT CERTIFICATION AND TRANSMITTAL FORM

Project Name:

Owner:

Contractor:

Address:

_____ hereby transmits and certifies to Engineer that the Drawings submitted to the Engineer on _____ reflect all changes to the Construction Plans as issued by the Engineer.

Contractor's Authorized Representative

Date

Engineer's Signature of Receipt

Date

TITLE WARRANTY

Contractor:	
Contractor Address:	
Owner:	
Owner Address:	
Project Name:	
Project No.:	

We, the Contractor, do hereby warrant that all labor, equipment, materials furnished, and work performed in conjunction with the above referenced Project or partial component of the Project are in accordance with the Contract Documents and authorized modifications thereto and will be free from defects due to defective materials or workmanship for a period of 12 months from Date of Certificate of Construction Completion and from Date of Substantial Completion of facilities immediately placed in operation for the Project.

Should any defect develop during the warranty period due to improper materials, workmanship, or arrangement, the same including adjacent work displaced shall be made good by the undersigned at no expense to the Owner. This Warranty shall be in addition to and in limitation of any other warranty or remedy required by law or by the Contract Documents.

Contractor:	
Signature:	
Person Authorized to Execute this Warranty on behalf of the Contractor:	
Date:	

AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS FORMS

STATE OF TEXAS

COUNTY OF _____

A F F I D A V I T

THAT I, the undersigned, being duly sworn, say that I was the Contractor for the performance of certain work entered into the _____ day of _____, 20____, between the City of _____, Texas and _____ for construction of _____ project.

KNOW ALL MEN BY THESE PRESENTS

1. The undersigned hereby certifies the improvements on the aforementioned project have been fully and satisfactorily completed in conformity with the contract.
2. The undersigned further certifies that there are no claims of laborers or mechanics for unpaid wages arising out of the performance of said contract and that the wage rates paid by Contractor and all Subcontractors were in conformity with the contract provisions relating to said wage rates.
3. The undersigned further certifies that there are no claims of subcontractors or materials suppliers for unpaid bills for labor or materials and supplies furnished in the course of the contract.

CERTIFIED TRUE AND CORRECT

Contractor

STATE OF TEXAS

COUNTY OF _____

BEFORE me, the undersigned, a Notary Public in and for said County and State, on this day personally appeared _____, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

Given under my hand and seal of office this _____ day of _____, A.D., 20____.

Notary Public in and for

(SEAL)

County, Texas

My Commission Expires _____

END OF SECTION

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APPENDIX A

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. Compliance with Regulations: The contractor (hereinafter includes consultants) will comply with the Acts and the Regulations relative to Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation, the Federal Highway Administration, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. Nondiscrimination: The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.

3. Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Nondiscrimination on the grounds of race, color, or national origin.

4. Information and Reports: The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the Federal Highway Administration to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the Recipient or the Federal Highway Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. Sanctions for Noncompliance: In the event of a contractor's noncompliance with the Nondiscrimination provisions of this contract, the Recipient will impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to:

- a. withholding payments to the contractor under the contract until the contractor complies; and/or
- b. cancelling, terminating, or suspending a contract, in whole or in part.

6. Incorporation of Provisions: The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the Recipient or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

APPENDIX E

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees to comply with the following nondiscrimination statutes and authorities; including but not limited to:

Pertinent Nondiscrimination Authorities:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21.
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex);
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability); and 49 CFR Part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 U.S.C. § 4 71, Section 4 7123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, subrecipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131-12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38;
- The Federal Aviation Administration's Nondiscrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq.).

CIVIL ENGINEER



Salvatore Pellittieri, PE

License No. 143207

KSA Engineers, Inc.

4833 Spicewood Springs Rd.

Austin, TX 78759

(512) 342-6868

TBPE Firm No. F-1356

This document is released
for the purpose of interim
review under the authority
of **Salvatore J. Pellittieri III**,
P.E., Lic. # 143207, on
2/4/2023. It is not to be used
for construction, bidding, or
permit purposes.

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SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 CONTRACT DESCRIPTION

- A. Work includes construction of 100,000 gallon stand pipe storage tank with associated pipe, valves, and mixer. Work also includes all electrical upgrades associated with the project.
- B. Perform Work under Contract with Owner according to Conditions of Contract.

1.2 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limit use of Site and premises to allow:
 - 1. Owner occupancy.
- B. Construction Operations: Limited to areas indicated on Drawings.
- C. Time Restrictions for Performing Work: Daylight Hours.
- D. Utility Outages and Shutdown:
 - 1. Coordinate and schedule electrical and other utility outages with Owner.
 - 2. Outages: Allowed only at previously agreed upon times.
 - 3. At least one week before scheduled outage, submit Outage Request Plan to Architect/Engineer itemizing the dates, times, and duration of each requested outage.
- E. Sound Level Restrictions: Sound pressure level measured at boundary of Site shall not exceed: Not applicable.
- F. Construction Plan: Before start of construction, submit three copies of construction plan regarding access to Work, use of Site, and utility outages for acceptance by Owner. After acceptance of plan, construction operations shall comply with accepted plan unless deviations are accepted by Owner in writing.
- G. Coordinate use of premises with Owner.
- H. Contractor shall assume full responsibility for security of all his/her and his/her subcontractors' materials and equipment stored on the site.
- I. If directed by the Owner, move any stored items that interfere with operations of Owner or other contractors.
- J. Obtain and pay for use of additional storage or work areas if needed to perform the Work.
- K. Contractor shall submit to the Owner for approval a plan of operations, designating proposed areas of the property to be used for his operations, material storage, equipment storage, employee's parking, offices and shops.

- L. Any damage to existing facilities, including contamination, which may be caused by Contractor's personnel, callers, visitors, materials or equipment, shall be repaired or corrected at the sole expense of the Contractor.
- M. Any fence that is damaged or removed by the Contractor shall be replaced at the Contractor's expense in like kind, and to the satisfaction of the Engineer.

1.3 WORK SEQUENCE

- A. Construct Work in order to accommodate Owner's occupancy requirements during construction period. Coordinate construction schedule and operations with Owner:
- B. Sequencing of Construction Plan: Before start of construction, submit three copies of construction plan regarding phasing of Work for acceptance by Owner. After acceptance of plan, construction sequencing shall comply with accepted plan unless deviations are accepted by Owner in writing.

1.4 OWNER OCCUPANCY

- A. Schedule the Work to accommodate Owner occupancy.

1.5 PERMITS

- A. Furnish necessary permits for construction of Work.

1.6 CONNECTIONS TO EXISTING FACILITIES

- A. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities including structures, drain lines, and utilities. In each case, Contractor shall notify Owner's Representative three weeks prior to any shut downs or tie-ins. Notice shall include written procedure describing all aspects of work, including but not limited to materials, safety, confined space entry, time to complete, and cure time, as applicable. Contractor shall receive written permission from the Owner's Representative prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage.
- B. Connections to existing facilities which are in service shall be thoroughly planned in advance and all required equipment, materials and labor shall be on hand at the time of undertaking the connection. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utility, when required, shall be by or under the direct supervision of the owning utility.

CITY OF KILLEEN
KSA PROJECT NO. KIL014

AIRPORT PUMP STATION UPDATE
FEBRUARY 2023

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 10 00

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SECTION 01 20 00 – PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Schedule of Values.
- B. Application for Payment.
- C. Change procedures.
- D. Defect assessment.

1.2 SCHEDULE OF VALUES

- A. Submit printed schedule on Progress Estimate schedule on EJCDC C-620.
- B. Submit Schedule of Values within 15 days after date established in Notice to Proceed.
- C. Format: Use Table of Contents of this Project Manual. Identify each line item with number and title of major Specification Section. Also identify Site mobilization, bonds and insurance, and equipment startup.
- D. Include a line item amount for allowances as specified in this Section.
- E. Include within each line item, direct proportional amount of Contractor's overhead and profit.
- F. Revise schedule to list approved Change Orders with each Application for Payment.

1.3 APPLICATION FOR PAYMENT

- A. Submit six (6) copies of each Application for Payment on EJCDC C-620 - Contractor's Application for Payment.
- B. Content and Format: Use Schedule of Values for listing items in Application for Payment.
- C. Submit updated construction schedule with each Application for Payment.
- D. Payment Period: Submit at intervals stipulated during the pre-construction meeting.
- E. Submit submittals with transmittal letter as specified in Section 01 33 00 - Submittal Procedures.
- F. Substantiating Data: When Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:
 - 1. Partial release of liens from major Subcontractors and vendors.
 - 2. Record Documents as specified in Section 01 70 00 - Execution and Closeout Requirements, for review by Owner, which will be returned to Contractor.
 - 3. Affidavits attesting to off-Site stored products.

4. Construction Progress Schedule, revised and current as specified in Section 01 33 00 - Submittal Procedures.

1.4 CHANGE PROCEDURES

- A. Submittals: Submit name of individual who is authorized to receive change documents and is responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. Carefully study and compare Contract Documents before proceeding with fabrication and installation of Work. Promptly advise Engineer of any error, inconsistency, omission, or apparent discrepancy.
- C. Requests for Interpretation (RFI) and Clarifications: Allot time in construction scheduling for liaison with Engineer; establish procedures for handling queries and clarifications.
 1. Use AIA G716 - Request for Information or CSI Form 13.2A - Request for Interpretation for requesting interpretations.
 2. Engineer may respond with a direct answer on the Request for Interpretation form, Clarification Notice, or EJCDC C-942 - Field Order, or Proposal Request.
- D. Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on EJCDC C-942.
- E. Engineer may issue Proposal Request including a detailed description of proposed change with supplementary or revised Drawings and Specifications, a change in Contract Time for executing the change. Contractor will prepare and submit estimate within five (5) days.
- F. Contractor may propose changes by submitting a request for change to Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change and the effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on the Work by separate or other Contractors.
- G. Document requested substitutions according to Section 01 25 00 - Substitution Procedures.
- H. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed price quotation.
- I. Unit Price Change Order: For Contract unit prices and quantities, the Change Order will be executed on a fixed unit price basis. For unit costs or quantities of units of that which are not predetermined, execute Work under Work Directive Change. Changes in Contract Sum/Price or Contract Time will be computed as specified for Time and Material Change Order.
- J. Work Directive Change: Engineer may issue directive, on EJCDC C-940 - Work Change Directive signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.
- K. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract. Engineer will determine change allowable in Contract Sum/Price and Contract Time as provided in Contract Documents.
- L. Maintain detailed records of Work done on time and material basis. Provide full information required for evaluation of proposed changes and to substantiate costs for changes in the Work.

- M. Document each quotation for change in Project Cost or Time with sufficient data to allow evaluation of quotation.
- N. Change Order Forms: EJCDC C-941 - Change Order.
- O. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
- P. Correlation of Contractor Submittals:
 - 1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
 - 2. Promptly revise Progress Schedules to reflect change in Contract Time, revise subschedules to adjust times for other items of Work affected by the change, and resubmit.
 - 3. Promptly enter changes in Record Documents.

1.5 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of Engineer, it is not practical to remove and replace the Work, Engineer will direct appropriate remedy or adjust payment.
- C. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Engineer.
- D. Defective Work will be partially repaired according to instructions of Engineer, and unit sum/price will be adjusted to new sum/price at discretion of Engineer.
- E. Individual Specification Sections may modify these options or may identify specific formula or percentage sum/price reduction.
- F. Authority of Engineer to assess defects and identify payment adjustments is final.
- G. Nonpayment for Rejected Products: Payment will not be made for rejected products for any of the following reasons:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from transporting vehicle.
 - 4. Products placed beyond lines and levels of the required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected products.

CITY OF KILLEEN
KSA PROJECT NO. KIL014

AIRPORT PUMP STATION UPDATE
FEBRUARY 2023

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 20 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance.
- B. Product options.
- C. Product substitution procedures.

1.2 QUALITY ASSURANCE

- A. Contract is based on products and standards established in Contract Documents without consideration of proposed substitutions.
- B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.
- C. Substitution Proposals: Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by Owner.

1.3 PRODUCT SUBSTITUTION PROCEDURES

- A. Section 00 21 13 - Instructions to Bidders specifies time restrictions for submitting requests for substitutions during Bidding period.
- B. Document each request with complete data, substantiating compliance of proposed substitution with Contract Documents, including:
 - 1. Manufacturer's name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.
 - 2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, and other pertinent characteristics.
 - 3. Reference to Article and Paragraph numbers in Specification Section.
 - 4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
 - 5. Changes required in other Work.
 - 6. Availability of maintenance service and source of replacement parts as applicable.
 - 7. Certified test data to show compliance with performance characteristics specified.
 - 8. Samples when applicable or requested.
 - 9. Other information as necessary to assist Architect/Engineer's evaluation.
- C. A request constitutes a representation that Bidder:

1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 2. Will provide same warranty for substitution as for specified product.
 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 5. Will coordinate installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
 6. Will reimburse Owner Engineer for review or redesign services associated with reapproval by authorities having jurisdiction.
- D. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request or when acceptance will require revision to Contract Documents.
- E. Substitution Submittal Procedure:
1. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
 2. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 25 00

SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Coordination and Project conditions.
- B. Preconstruction meeting.
- C. Site mobilization meeting.
- D. Progress meetings.
- E. Pre-Construction meetings.
- F. Closeout meeting.
- G. Alteration procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various Sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
- B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment in service.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practical; place runs parallel with lines of building. Use spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
 - 1. Coordination Drawings: Prepare as required to coordinate all portions of Work. Show relationship and integration of different construction elements that require coordination during fabrication or installation to fit in space provided or to function as intended. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are important.
- D. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion.

- G. After Owner's occupancy of premises, coordinate access to Site for correction of defective Work and Work not complying with Contract Documents, to minimize disruption of Owner's activities.

1.3 PRECONSTRUCTION MEETING

- A. Engineer will schedule and preside over meeting after Notice of Award.
- B. Attendance Required: Engineer, Owner, Resident Project Representative, appropriate governmental agency representatives, major Subcontractors, and Contractor.
- C. Minimum Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of Subcontractors, list of products, schedule of values, and Progress Schedule.
 - 5. Designation of personnel representing parties in Contract, Owner and Engineer.
 - 6. Communication procedures.
 - 7. Procedures and processing of requests for interpretations, field decisions, field orders, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
 - 8. Scheduling.
 - 9. Critical Work sequencing.
 - 10. Scheduling activities of Special Inspector.
- D. Engineer: Record minutes and distribute copies to participants within five days after meeting, to Contractor, Owner, and those affected by decisions made.

1.4 PROGRESS MEETINGS

- A. Engineer shall schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Engineer will make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.
- C. Attendance Required: Job superintendent, major Subcontractors Contractors and suppliers, and Engineer, Owner, as appropriate to agenda topics for each meeting.
- D. Minimum Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems impeding planned progress.
 - 5. Review of submittal schedule and status of submittals.
 - 6. Review of off-Site fabrication and delivery schedules.
 - 7. Maintenance of Progress Schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.

10. Coordination of projected progress.
 11. Maintenance of quality and work standards.
 12. Effect of proposed changes on Progress Schedule and coordination.
 13. Other business relating to Work.
- E. Engineer Record minutes and distribute copies to participants within five days after meeting, to Contractor, Owner, and those affected by decisions made.

1.1 PREINSTALLATION MEETINGS

- A. When required in individual Specification Sections, convene preinstallation meetings at Project Site before starting Work of specific Section.
- B. Require attendance of parties directly affecting, or affected by, Work of specific Section.
- C. Notify Engineer four days in advance of meeting date.
- D. Prepare agenda and preside over meeting:
 1. Review conditions of installation, preparation, and installation procedures.
 2. Review coordination with related Work.
- E. Record minutes and distribute copies to participants within two days after meeting, to Engineer, Owner, and those affected by decisions made.

1.5 CLOSEOUT MEETING

- A. Schedule Project closeout meeting with sufficient time to prepare for requesting Substantial Completion. Preside over meeting and be responsible for minutes.
- B. Attendance Required: Contractor, major Contractors major Subcontractors, Engineer, Owner, and others appropriate to agenda.
- C. Notify Engineer four days in advance of meeting date.
- D. Minimum Agenda:
 1. Start-up of facilities and systems.
 2. Operations and maintenance manuals.
 3. Testing, adjusting, and balancing.
 4. System demonstration and observation.
 5. Operation and maintenance instructions for Owner's personnel.
 6. Contractor's inspection of Work.
 7. Contractor's preparation of an initial "punch list."
 8. Procedure to request Engineer inspection to determine date of Substantial Completion.
 9. Completion time for correcting deficiencies.
 10. Inspections by authorities having jurisdiction.
 11. Certificate of Occupancy and transfer of insurance responsibilities.
 12. Partial release of retainage.
 13. Final cleaning.
 14. Preparation for final inspection.

15. Closeout Submittals:
 - a. Project record documents.
 - b. Operating and maintenance documents.
 - c. Operating and maintenance materials.
 - d. Affidavits.
 16. Final Application for Payment.
 17. Contractor's demobilization of Site.
 18. Maintenance.
- E. Record minutes and distribute copies to participants within two days after meeting, to Engineer, Owner, and those affected by decisions made.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 ALTERATION PROCEDURES

- A. Entire facility will be occupied for normal operations during progress of construction. Cooperate with Owner in scheduling operations to minimize conflict and to permit continuous usage.
 1. Perform Work not to interfere with operations of occupied areas.
 2. Keep utility and service outages to a minimum and perform only after written approval of Owner.
 3. Clean Owner-occupied areas daily. Clean spillage, overspray, and heavy collection of dust in Owner-occupied areas immediately.
- B. Materials: As specified in product Sections; match existing products with new products for patching and extending Work.
- C. Employ skilled and experienced installer to perform alteration and renovation Work.
- D. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion. Comply with Section 01 70 00 - Execution and Closeout Requirements
- E. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- F. Remove debris and abandoned items from area and from concealed spaces.
- G. Prepare surface and remove surface finishes to permit installation of new Work and finishes.
- H. Close openings in exterior surfaces to protect existing Work from weather and extremes of temperature and humidity.
- I. Remove, cut, and patch Work to minimize damage and to permit restoring products and finishes to specified condition.

- J. Refinish existing visible surfaces to remain in renovated rooms and spaces, to specified condition for each material, with neat transition to adjacent finishes.
- K. Where new Work abuts or aligns with existing Work, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- L. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Architect/Engineer for review.
- M. Patch or replace portions of existing surfaces that are damaged, lifted, discolored, or showing other imperfections.
- N. Finish surfaces as specified in individual product Sections.

END OF SECTION 01 30 00

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SECTION 01 32 16 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. Bar chart schedules.
- D. Review and evaluation.
- E. Updating schedules.
- F. Distribution.

1.2 SUBMITTALS

- A. Submit schedules under transmittal letter form specified in Section 01 33 00 - Submittal Procedures.
- B. Schedule Updates:
 - 1. Overall percent complete, projected and actual.
 - 2. Completion progress by listed activity and sub-activity, to within five working days prior to submittal.
 - 3. Changes in Work scope and activities modified since submittal.
 - 4. Delays in submittals or resubmittals, deliveries, or Work.
 - 5. Adjusted or modified sequences of Work.
 - 6. Other identifiable changes.
 - 7. Revised projections of progress and completion.
- C. Narrative Progress Report:
 - 1. Submit with each monthly submission of Progress Schedule.
 - 2. Summary of Work completed during the past period between reports.
 - 3. Work planned during the next period.
 - 4. Explanation of differences between summary of Work completed and Work planned in previously submitted report.
 - 5. Current and anticipated delaying factors and estimated impact on other activities and completion milestones.
 - 6. Corrective action taken or proposed.

1.3 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel specializing in scheduling with two years' minimum experience in scheduling construction work of complexity comparable to the Project, and having use of computer facilities capable of delivering detailed graphic printout within 48 hours of request.
- B. Contractor's Administrative Personnel: Two years' minimum experience in using and monitoring schedules on comparable Projects.

1.4 BAR CHART SCHEDULES

- A. Format: Bar chart Schedule, to include at least:
 - 1. Identification and listing in chronological order of those activities reasonably required to complete the Work, including:
 - a. Subcontract Work.
 - b. Other Contractor Work.
 - c. Major equipment design, fabrication, factory testing, and delivery dates including required lead times.
 - d. Move-in and other preliminary activities.
 - e. Equipment and equipment system test and startup activities.
 - f. Project closeout and cleanup.
 - g. Work sequences, constraints, and milestones.
 - 2. Listings identified by Specification Section number.
 - 3. Identification of the following:
 - a. Horizontal time frame by year, month, and week.
 - b. Duration, early start, and completion for each activity and subactivity.
 - c. Critical activities and Project float.
 - d. Subschedules to further define critical portions of Work.

1.5 REVIEW AND EVALUATION

- A. Participate in joint review and evaluation of schedules with Architect/Engineer at each submittal.
- B. Evaluate Project status to determine Work behind schedule and Work ahead of schedule.
- C. After review, revise schedules incorporating results of review, and resubmit within 10 days.

1.6 UPDATING SCHEDULES

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity. Annotate schedules to depict current status of Work.

- C. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- D. Upon approval of a Change Order, include the change in the next schedule submittal.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit sorts as required to support recommended changes.
- G. Prepare narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken or proposed and its effect including effects of changes on schedules of separate Contractors.

1.7 DISTRIBUTION

- A. Following joint review, distribute copies of updated schedules to Contractor's Project site file, to Subcontractors, suppliers, Engineer, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 32 16

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SECTION 01 32 33 - CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.1 SUMMARY

- A. CONTRACTOR shall be responsible for the production of construction photographs and video documentation as provided herein.

1.2 SUBMITTALS

- A. See Section 01 33 00.
- B. Provide CD(s) containing digital photographs of entire project after completion. Each CD shall be marked with the name and number of contract, name of CONTRACTOR, description and location of photograph.
- C. Bound hard-copy color photographs as described herein.

1.3 QUALITY

- A. All photographs shall be digital quality of 3.2 megapixel or higher resolution.
- B. All copyrights or other restrictions on the use of all photographic prints or digital source files shall be released to the OWNER so that the OWNER may reproduce, modify, and/or publish photographs in any form or medium.

1.4 VIEWS AND QUANTITIES

- A. Each month, an average of 100 exposures shall be taken as directed by Owner's Representative. Plan a minimum of five photos per day.
- B. Proofs of all exposures, in digital format on CD, shall be promptly furnished to the Owner's Representative at the end of each month. The Owner's Representative shall select an average of twenty exposures per month to be submitted as described under Products.

1.5 PRE-CONSTRUCTION PHOTOGRAPHS

- A. Preconstruction photos recording of the entire project site, access points, perimeter fencing, features adjacent to the site and access roads shall be required.
- B. A minimum of 30 photos shall be taken prior to any work being done. These photos will be taken at all areas and surround areas where construction will take place.

1.6 FINAL PHOTOGRAPHS

- A. All photos that were taken at the beginning (pre-construction) shall be taken after all work (including re-vegetation) has been completed.

PART 2 - PRODUCTS

2.1 Photo Submittals

- A. Color
- B. Finish shall be matte
- C. Paper shall be white base, single weight
- D. Size shall be 4 x 6 inch
- E. Mounting shall be in acetate folders.
- F. Identification consisting of project title, description of view, name of Contractor, time and date of exposure, location of camera on key plan, arrows to indicate direction of view on key plan, photographer's name, and identification of exposure to match the referenced, accompanied index.
- G. Prints shall be bound and indexed by date and photo number.

PART 3 - EXECUTION

3.1 EXECUTION

- A. These photographs shall be submitted with the CONTRACTOR'S application for progress payment.
- B. The photographs shall present important factual details with high resolution, minimum distortion and maximum depth-of-field and sharpness. Views shall adequately illustrate project status or condition of construction.
- C. CONTRACTOR shall perform preconstruction photos and submit OWNER's copy before any equipment, materials, or forces have been mobilized to the site.
- D. OWNER's Representative shall accompany CONTRACTOR during the preconstruction photography.
- E. Intent is to document preconstruction condition of existing features.

END OF SECTION 01 32 33

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Definitions.
- B. Submittal procedures.
- C. Construction progress schedules.
- D. Proposed product list.
- E. Product data.
- F. Shop Drawings.
- G. Samples.
- H. Other submittals.
- I. Design data.
- J. Test reports.
- K. Certificates.
- L. Manufacturer's instructions.
- M. Manufacturer's field reports.
- N. Erection Drawings.
- O. Contractor review.
- P. Engineer review.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.
- B. Informational Submittals: Written and graphic information and physical Samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer-accepted form attached.
- B. Sequentially number transmittal forms utilizing contract designation (GC: General Construction) starting with a -001 designation for the first submittal. Mark revised submittals with original number and sequential alphabetic suffix (i.e. GC-001R1).
- C. Identify: Project, Contractor, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number appropriate to submittal.
- D. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite Project, and submit electronic submittals via email as PDF electronic files. Large submittals and submittals as requested by the Engineer shall also be submitted in hard copy format to the Engineer in the number requested. Coordinate submission of related items.
- F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.
- G. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.
- H. Allow space on submittals for Contractor and Engineer review stamps.
- I. When revised for resubmission, identify changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- K. Submittals not requested will not be recognized nor processed.
- L. Incomplete Submittals: Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Engineer.

1.4 CONSTRUCTION PROGRESS SCHEDULES

- A. Comply with Section 01 32 16 - Construction Progress Schedule

1.5 PROPOSED PRODUCT LIST

- A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

1.6 PRODUCT DATA

- A. Product Data: Action Submittal: Submit to Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Submit electronic submittals via email as PDF electronic files. Large submittals and submittals as requested by the Engineer shall also be submitted in hard copy format to the Engineer in the number requested. Coordinate submission of related items.
- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.7 SHOP DRAWINGS

- A. Shop Drawings: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer responsible for designing components shown on Shop Drawings.
 - 1. Include signed and sealed calculations to support design.
 - 2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
 - 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. Submit electronic submittals via email as PDF electronic files. Large submittals and submittals as requested by the Engineer shall also be submitted in hard copy format to the Engineer in the number requested. Coordinate submission of related items.
- E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.8 SAMPLES

- A. Samples: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Samples for Selection as Specified in Product Sections:

1. Submit to Engineer for aesthetic, color, and finish selection.
 2. Submit Samples of finishes, textures, and patterns for Engineer selection.
- C. Submit Samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate Sample submittals for interfacing work.
- D. Include identification on each Sample, with full Project information.
- E. Submit number of Samples specified in individual Specification Sections; Engineer will retain one Sample.
- F. Reviewed Samples that may be used in the Work are indicated in individual Specification Sections.
- G. Samples will not be used for testing purposes unless specifically stated in Specification Section.
- H. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.9 OTHER SUBMITTALS

- A. Closeout Submittals: Comply with Section 01 70 00 - Execution and Closeout Requirements.
- B. Informational Submittal: Submit data for Engineer's knowledge as Contract administrator or for Owner.
- C. Submit information for assessing conformance with information given and design concept expressed in Contract Documents.

1.10 TEST REPORTS

- A. Informational Submittal: Submit reports for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.11 CERTIFICATES

- A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Engineer, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product but must be acceptable to Engineer.

- D. Provide a Certification Letter on manufacturer's letterhead for all products covered by the 2014 Consolidated Appropriations Act, American Iron and Steel requirement that the submitted product is in conformance with the Act.

1.12 MANUFACTURER'S INSTRUCTIONS

- A. Informational Submittal: Submit manufacturer's installation instructions for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Engineer in quantities specified for Product Data.
- C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.13 MANUFACTURER'S FIELD REPORTS

- A. Informational Submittal: Submit reports for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit report in duplicate within 5 days of observation to Engineer for information.
- C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.14 RECORD DRAWINGS

- A. Submit Drawings in accordance with Section 01 78 39 sealed by a licensed surveyor in the State of Texas showing final alignment of Transmission Main.
- B. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

1.15 CONTRACTOR REVIEW

- A. Review for compliance with Contract Documents and approve submittals before transmitting to Engineer.
- B. Contractor: Responsible for:
 - 1. Determination and verification of materials including manufacturer's catalog numbers.
 - 2. Determination and verification of field measurements and field construction criteria.
 - 3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
 - 4. Determination of accuracy and completeness of dimensions and quantities.
 - 5. Confirmation and coordination of dimensions and field conditions at Site.
 - 6. Construction means, techniques, sequences, and procedures.
 - 7. Safety precautions.

8. Coordination and performance of Work of all trades.
- C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.
- D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Engineer.

1.16 ENGINEER REVIEW

- A. Do not make "mass submittals" to Engineer. "Mass submittals" are defined as six or more submittals or items in one day or 15 or more submittals or items in one week. If "mass submittals" are received, Engineer's review time stated above will be extended as necessary to perform proper review. Engineer will review "mass submittals" based on priority determined by Engineer after consultation with Owner and Contractor.
- B. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 1. No Exceptions Noted: When submittals are marked "No Exceptions Noted," that part of the work covered by the submittals may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
 2. Exceptions as Noted: When submittals are marked "Exceptions as Noted," that part of the work covered by the submittals may proceed provided that the noted exceptions are incorporated into the work and all the work covered by the submittals complies with the requirements of the Contract Documents. Final acceptance depends upon that compliance. Contractor has the option of revising his or her submittal with the marked exceptions for re-submittal.
 3. Revise and Resubmit: When submittal is marked "Revise and Resubmit," do not proceed with that part of the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark. Do not permit submittals marked "Revise and Resubmit" to be used at the Project site, or elsewhere where work is in progress.
 4. Rejected: When submittal is marked "Rejected", do not proceed with that part of the work covered by the submittal, including purchasing, fabrication, delivery or other activity. Contact Owner's Representative for explanation of rejection. Prepare a new submittal in accordance with specifications and Owner's Representative's comments; resubmit promptly. Repeat if necessary to obtain a different action mark. Do not permit submittals marked "Rejected" to be used at the Project Site or elsewhere the work of this Project is in progress.
 5. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Action Not Required".
- C. Informational submittals and other similar data are for Engineer's information, do not require Engineer's responsive action, and will not be reviewed or returned with comment.
- D. Submittals made by Contractor that are not required by Contract Documents may be returned without action.

- E. Submittal approval does not authorize changes to Contract requirements unless accompanied by Change Order, Field Order, or Work Change Directive.
- F. Owner may withhold monies due to Contractor to cover additional costs beyond the second submittal review.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 SUBMITTAL COVER

- A. See Section 01 33 00.10 Submittal Cover.

END OF SECTION 01 33 00

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SUBMITTAL NO. (KSA USE ONLY)

CONTRACTOR _____

ADDRESS _____

TRADE CONTRACT _____

(check one)

[]

No. of Attached Pages _____

Subcontractor/Supplier_____

REFERENCES	Section No. (s) _____	Drawing No. (s) _____
	Part/Para- graph	Detail Reference

ENGINEER'S ACTION	CONTRACTOR'S APPROVAL STAMP
KSA Engineers, Inc. SHOP DRAWING REVIEW	(1) Provide Manufacturer's Certification Letter of Compliance with the provisions of the American Iron and Steel requirements. ☐ (2) Provide Contractor's Certification Letter of Compliance with the provisions of the American Iron and Steel requirements. ☐
Corrections or comments made on the shop drawings during this review do not relieve Contractor from compliance with requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the Project and general compliance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his or her work with that of all other trades; and performing his or her work in a safe and satisfactory manner. (O) NO EXCEPTIONS NOTED (O) EXCEPTIONS AS NOTED (O) REVISE AND RESUBMIT (O) REJECTED DATE _____ INITIAL _____	_____ DATE RECEIVED

SECTION 01 40 00 – QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality control.
- B. Tolerances.
- C. References.
- D. Labeling.
- E. Mockup requirements.
- F. Testing and inspection services.
- G. Manufacturers' field services.

1.2 QUALITY CONTROL

- A. Monitor quality control over suppliers, manufacturers, products, services, Site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with specified standards as the minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- C. Perform Work using persons qualified to produce required and specified quality.
- D. Products, materials, and equipment may be subject to inspection by Engineer at place of manufacture or fabrication. Such inspections shall not relieve Contractor of complying with requirements of Contract Documents.
- E. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

- 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 as of date of Contract Documents except where specific date is established by code.
- C. Obtain copies of standards and maintain on Site when required by product Specification Sections.
- D. When requirements of indicated reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- E. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference in reference documents.

1.5 LABELING

- A. Attach label from agency approved by authorities having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.
- B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:
 - 1. Model number.
 - 2. Serial number.
 - 3. Performance characteristics.
- C. Manufacturer's Nameplates, Trademarks, Logos, and Other Identifying Marks on Products: Not allowed on surfaces exposed to view in public areas, interior or exterior.

1.6 MOCK-UP REQUIREMENTS

- A. Tests will be performed under provisions identified in this Section and identified in individual product Specification Sections.
- B. Assemble and erect specified or indicated items with specified or indicated attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mockups shall be comparison standard for remaining Work.
- D. Where mockup has been accepted by Engineer and is specified in product Specification Sections to be removed, remove mockup and clear area when directed to do so by Engineer.

1.7 TESTING AND INSPECTION SERVICES

- A. Contractor will employ and pay for specified services of an independent firm to perform testing and inspection.

- B. Independent firm will perform tests, inspections, and other services specified in individual Specification Sections and as required by Engineer, Owner and authorities having jurisdiction.
- C. Testing, inspections, and source quality control may occur on or off Project Site. Perform off-Site testing as required by Engineer or Owner.
- D. Reports shall be submitted by independent firm to Engineer, Contractor, and authorities having jurisdiction, in duplicate, indicating observations and results of tests and compliance or noncompliance with Contract Documents.
 - 1. Submit final report indicating correction of Work previously reported as noncompliant.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify Engineer and independent firm 24 hours before expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional Samples and tests required for Contractor's use.
- F. Employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work according to requirements of Contract Documents.
- G. Retesting or re-inspection required because of nonconformance with specified or indicated requirements shall be performed by same independent firm on instructions from Engineer. Payment for retesting or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.
- H. Agency Responsibilities:
 - 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 indicated sampling and testing of products according to specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Engineer and Contractor of observed irregularities or nonconformance of Work or products.
 - 6. Perform additional tests required by Engineer.
 - 7. Attend preconstruction meetings and progress meetings.
- I. Agency Reports: After each test, promptly submit two copies of report to Engineer, Contractor, and authorities having jurisdiction. When requested by Engineer, provide interpretation of test results. Include the following:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Name of inspector.
 - 4. Date and time of sampling or inspection.
 - 5. Identification of product and Specification Section.
 - 6. Location in Project.
 - 7. Type of inspection or test.
 - 8. Date of test.
 - 9. Results of tests.

10. Conformance with Contract Documents.

J. Limits on Testing Authority:

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.

1.8 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, startup of equipment, testing, adjusting, and balancing of equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Engineer 30 days in advance of required observations. Observer is subject to approval of Engineer.
- C. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.
- D. Refer to Section 01 33 00 - Submittal Procedures, "Manufacturer's Field Reports" Article.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 MOBILIZATION

- A. Mobilization shall include, but not be limited to, these principal items:
 - 1. Obtaining required permits.
 - 2. Installing temporary construction power, wiring, and lighting facilities.
 - 3. Providing onsite communication facilities, including telephones.
 - 4. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations, and governing agencies.
 - 5. Arranging for and erection of CONTRACTOR's work and storage yard.
 - 6. Posting OSHA required notices and establishing safety programs and procedures.
 - 7. Having CONTRACTOR's superintendent at site full time.
- B. Area is available at the site on OWNER's property for CONTRACTOR's temporary facilities as defined by the Limits of Construction shown on the Drawings.

1.2 PROTECTION OF WORK AND PROPERTY

- A. Inform OWNER and Engineer immediately of serious onsite accidents and related claims.
- B. Use of Explosives: No blasting or use of explosives is allowed.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TEMPORARY UTILITIES

- A. Power:
 - 1. Electric power is available at site. Make arrangements to obtain and pay for electrical power as needed for CONTRACTOR's use.
- B. Water:
 - 1. No potable water is available at site. Make arrangements for and bear costs of providing water required for construction purposes and for drinking by construction personnel during construction.
 - 2. Water for testing and disinfection may be obtained from the OWNER. See specific requirements specified elsewhere in the Contract Documents.
- C. Sanitary and Personnel Facilities:
 - 1. Provide and maintain facilities for CONTRACTOR's employees, Subcontractors, and all other onsite employers' employees. Service, clean, and maintain facilities and enclosures.

- D. Fire Protection: Furnish and maintain on site adequate firefighting equipment capable of extinguishing incipient fires. Comply with applicable parts of National Fire Prevention Standard for Safeguarding Building Construction Operations (NFPA No. 241).

3.2 PROTECTION OF WORK AND PROPERTY

A. Utilities:

1. Maintain in continuous service all existing oil and gas pipelines, underground or overhead power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and all other utilities encountered along line of the Work, unless other arrangements satisfactory to owners of said utilities have been made.
2. Where completion of the Work requires temporary or permanent removal or relocation of existing utility, coordinate all activities with owner of said utility and perform all work to their satisfaction.
3. Locations of existing utilities shown on the Plans should be considered approximate. The Contractor shall verify the location of any potentially affected utility prior to starting work in any area.
4. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
5. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
6. In areas where CONTRACTOR's operations are adjacent to or near a utility, such as gas, telephone, television, electric power, water, sewer, or irrigation system, and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection have been made by CONTRACTOR.
7. Notify property owners and utility offices that may be affected by construction operation at least 2 days in advance. Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to CONTRACTOR's operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.
8. Do not impair operation of existing water and sewer system. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures.
9. Utilities or appurtenances, driveways, drainage structures, roadways or other public or private improvements which are damaged by the Contractor shall be replaced to original condition at no cost to the Owner.

B. Easements and Public Right-of-Way:

1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
2. No residence or business shall be cut off from vehicular traffic for a period exceeding 2 hours, unless special arrangements have been made.
3. CONTRACTOR shall repair all damages to any existing utility line, fence, driveway or other improvement that occurs as a result of the Work with such repairs to be made with materials of like quality and in a manner that restores the facility to its prior capacity, condition and proper function as soon as practical.
4. Where completion of the Work requires temporary or permanent removal or relocation of existing fencing, Contractor is responsible for providing temporary or permanent fencing equivalent to the existing or better to the satisfaction of the Engineer and property owner.

Coordinate all activities with the Engineer and property owner prior to any relocation or removal.

5. The Contractor is responsible for assuring that adequate temporary fencing is provided to assure that livestock or personnel do not enter the construction area.
6. Contractor shall keep all existing gates closed except when in actual use.
7. If an existing fence is temporarily or permanently removed for construction or if an existing gate must remain open, CONTRACTOR shall provide temporary fencing or other arrangements approved by the Engineer to prevent movement of livestock between the areas the removed fence or open gate was designed to separate, and shall promptly replace the removed fence with permanent fencing of substantially the same quality and material as the fence so removed.
8. CONTRACTOR shall remove all rocks, timber, brush, and other debris from the site and shall properly dispose of all such material. CONTRACTOR shall provide written approval by the landowner prior to placing any material removed from the site on private property.
9. Removal of all rocks, timber, brush, and other debris generated as a result of the Work shall be accomplished by the CONTRACTOR within 28 calendar days after such debris is generated.
10. The CONTRACTOR shall not engage in or allow any hunting, fishing or trapping on the site or private property adjacent to the site.
11. Maintain original site drainage and restore original surface contours except where specifically indicated on the Plans or where approved by the Engineer.

C. Waterways:

1. Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.
2. Comply with all requirements of the Storm Water Pollution Prevention Plan (SWPPP) prepared for the project where applicable.

3.3 TEMPORARY CONTROLS

A. Air Pollution Control:

1. Minimize air pollution from construction operations.
2. Burning of waste materials, rubbish, or other debris will not be permitted on or adjacent to site.
3. Conduct operations of dumping rock and of carrying rock away in trucks to cause a minimum of dust. Give unpaved streets, roads, detours, or haul roads used in construction area a dust-preventive treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.
4. Provide and maintain temporary dust-tight partitions, bulkheads, or other protective devices during construction to permit normal operation of existing facilities. Construct partitions of plywood, insulating board, plastic sheets, or similar material. Construct partitions in such a manner that dust and dirt from demolition and cutting will not enter other parts of existing building or facilities. Remove temporary partitions as soon as need no longer exists.

END OF SECTION 01 50 00

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SECTION 01 60 00 – PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Equipment electrical characteristics and components.

1.2 PRODUCTS

- A. At minimum, comply with specified requirements and reference standards.
- B. Specified products define standard of quality, type, function, dimension, appearance, and performance required.
- C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.
- D. Do not use materials and equipment removed from existing premises except as specifically permitted by Contract Documents.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products according to manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products; use methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products according to manufacturer's instructions.
- B. Store products with seals and labels intact and legible.

- C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.
- D. For exterior storage of fabricated products, place products on sloped supports aboveground.
- E. Provide bonded off-Site storage and protection when Site does not permit on-Site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Products complying with specified reference standards or description.
- B. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit Request for Substitution for any manufacturer not named, according to Section 01 25 00 - Substitution Procedures.

PART 2 - PRODUCTS

2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Include lugs for terminal box.
- B. Cord and Plug: Furnish minimum 6-foot long cord and plug including grounding connector for connection to electric wiring system. Cord of longer length may be specified in individual Specification Sections.

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 60 00

SECTION 01 66 50 - TESTING OF PIPELINES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, tools, equipment and related items required to perform exfiltration testing and deflection testing of facility piping system and to perform pressure and leakage testing of pressure pipelines.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

- A. Hydrostatic pressure and leakage tests shall be made on all pressure pipelines carrying water or wastewater.
- B. All labor and equipment, including test pump with regulated by-pass meters and gauges required for conducting pipeline tests, shall be furnished by the CONTRACTOR. The CONTRACTOR shall furnish equipment and necessary piping as required to transport water used in testing from source to test location.
- C. Time and sequence of testing shall be scheduled by the CONTRACTOR, subject to observation and approval by the OWNER. The CONTRACTOR shall provide adequate labor, tools and equipment to operate valves and to locate and repair any leaks discovered during the initial filling of the pipeline prior to actual testing or during the course of the tests.

3.2 CLEANING

- A. At the conclusion of the work, thoroughly clean all pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material that may have entered the pipes during the construction period. Debris cleaned from the lines shall be removed from the low end of the pipeline. If after this cleaning, obstructions remain, they shall be removed. After the pipelines are cleaned and if the groundwater level is above the pipe or following a heavy rain, the ENGINEER will examine the pipes for leaks. If any defective pipes or joints are discovered, they shall be repaired.

3.3 TEST PROCEDURES FOR GRAVITY PIPELINES

- A. Gravity pipelines shall be installed and backfilled and then tested using either Exfiltration Water Testing or Low Pressure Air Testing. In addition, flexible pipes shall be tested using an Allowable Deflection Test.
 - 1. Exfiltration Water Testing

- a. The section of pipe to be tested shall be filled with water and allowed to stand for such time as is required for the pipeline to adsorb such water as it will and for the escape of all air from the line. The sections undergoing test shall be carefully examined for leakage. All known leaks shall be repaired, regardless of these test requirements.
 - b. The line shall then be filled to a reference level in manhole or in a reservoir of sufficient capacity to allow for a reference level to be established. The reservoir must be of sufficient capacity as to not allow the water level to drop below the crown of the pipe during the 24-hour test period. If the water level drops below the crown of the pipe, the test shall be voided and run again or until such time the water level is maintained above the crown throughout the duration of the test.
 - c. At the end of a 24-hour period, water, if needed, shall be added to the line to bring the water level back to the referenced line. All water added shall be accurately measured by an approved water meter so that an exfiltration rate can be established.
 - d. Leakage during the above test shall not exceed a rate equal to 25 gallons per inch of internal diameter per mile per twenty-four hours.
 - e. All observed leaks shall be repaired regardless of the measured leakage rate.
2. Low Pressure Air Testing
- a. This test shall conform to the procedure described in ASTM C828, ASTM C924 or other appropriate procedures. For safety reasons, air testing of sections of pipe shall be limited to lines less than 36 in. average inside diameter. Lines 36 in. average inside diameter and larger may be air tested at each joint. The minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge during a joint test, regardless of pipe size, shall be 20 seconds. For sections of pipe less than 36 in. average inside diameter, the maximum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be computed by the following equation:
$$T = 0.085 (D) (K) / (Q)$$
where T = time for pressure to drop 1.0 pounds per square inch gauge in seconds
K = 0.00049DL, but not less than 1.0
D = average inside diameter in inches
L = length of line of same pipe size being tested in feet
Q = rate of loss, assume 0.0015 ft³/min/sq.ft. internal surface
 - b. All observed leaks shall be repaired regardless of the air test results.
3. Allowable Deflection Test
- a. Pipe deflection testing shall be conducted on all gravity pipes constructed of flexible materials (PVC or other plastic materials).
 - b. Pipe deflection measured not less than ninety (90) days after the backfill has been completed as specified shall not exceed five (5.0) percent. Deflection shall be computed by multiplying the amount of deflection (nominal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.
 - c. Deflection shall be measured with a rigid mandrel device cylindrical in shape and constructed with a minimum of nine evenly spaced legs. The outer diameter of the legs shall be 95 percent of the pipe's actual internal diameter. Drawings of the mandrel with complete dimensions shall be submitted to the ENGINEER for each diameter of pipe to be tested. The mandrel shall be hand pulled by the CONTRACTOR through all sewer lines.
 - d. Any section of sewer not passing the mandrel shall be uncovered at the CONTRACTOR'S expense and the bedding and backfill replaced to prevent excessive deflection. Repaired pipe shall be retested.

3.4 TEST PROCEDURES FOR PRESSURE PIPELINES

A. General

1. After the pipe has been laid and backfilled and the backfill has been otherwise consolidated, all newly laid pipe, or any valved section thereof, shall be subjected to the hydrostatic pressure and leakage tests specified below for that particular type of pipe. The duration of each hydrostatic pressure test shall be at least one hour and each leakage test at least four hours, unless otherwise specified or noted on the Drawings. All meters, fixtures, devices or appliances which are connected to the pipeline system and which might be damaged if subjected to the specified test pressure shall be disconnected and the ends of the branch lines plugged or capped during the testing procedures.
2. Each valved (capped or plugged) section of pipe shall be filled slowly with water and all air shall be expelled. If permanent air vents are not located at all high points, the CONTRACTOR shall install corporation or blow-off cocks at such points so that air can be expelled as filling takes place. After verification that all air has been expelled, the cocks shall be closed and the pipe kept filled until tested. All exposed pipe, fittings, valves, hydrants and joints shall be examined while under test pressure and all visible leaks shall be stopped. Any cracked or defective pipe, fittings, valves or hydrants discovered during testing shall be removed and replaced by the CONTRACTOR. Replacement shall be with sound material and the test shall be repeated until satisfactory to the OWNER.

- B. Special Requirements. Where any section of pipeline is provided with concrete thrust blocking, the hydrostatic pressure test shall not be made until at least five (5) days have elapsed after installation of the blocking. However, if high-early-strength cement is used in the concrete, two (2) days shall have elapsed prior to testing.

C. Hydrostatic Pressure Tests

1. After compliance with all applicable procedures described above, pressure of 150 percent of the pipe's normal operating pressure shall be applied, unless another test pressure is specified for the type of pipe being tested. This pressure, based on the lowest point of the line or section under test, shall be corrected to the relative elevation of the test gauge and the pressure maintained for a period of not less than one (1) hour. CONTRACTOR shall coordinate all test pressures with ENGINEER.

D. Leakage Tests

1. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain the specified leakage test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.
2. Leakage shall be determined by recording the quantity of water pumped into the pipeline through a standard water meter of a size appropriate to secure an accuracy of ± 2 percent at the average rate of flow pumped. Leakage rate shall be calculated by extrapolation of the total leakage during the testing period to a 24-hour period. Leakage test pressure shall be coordinated with ENGINEER and test pressure shall be maintained for a period of four (4) hours.
3. Allowable leakage for the types of pipe used shall be as follows:
 - a. Cast Iron and Ductile Iron. Allowable as permitted by AWWA Standard C-600-82, "Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances", which is not to exceed that determined by the formula:

$$L = (SD\sqrt{P})/133,200$$

- b. Where L is the allowable leakage in gallons per hour, S is the length of pipeline tested in feet, D is the nominal diameter of the pipe in inches, and P is the average test pressure during the leakage tests in pounds per square inch gauge.
- 4. In the event any section of the line tested fails to meet the above specified requirements for water tightness, the cause of the excessive leakage shall be determined and remedied at the expense of the CONTRACTOR, including retesting if required.

3.5 FINAL ACCEPTANCE

- A. No pipe installation will be accepted until all known leaks have been repaired whether or not leakage is within allowable limits. Locating and repairing of leaks shall be performed by the CONTRACTOR at no additional cost to the OWNER.
- B. The OWNER will certify that all required pressure and leakage tests have been successfully completed before the pipeline is accepted.

3.6 WATER SOURCE

- A. Water shall be made available by the OWNER for testing and other work on this project as specified. Any additional water, if necessary, shall be provided at CONTRACTOR'S expense.

END OF SECTION

SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Field engineering.
- B. Closeout procedures.
- C. Starting of systems.
- D. Demonstration and instructions.
- E. Testing, adjusting, and balancing.
- F. Project record documents.
- G. Operation and maintenance data.
- H. Manual for materials and finishes.
- I. Manual for equipment and systems.
- J. Spare parts and maintenance products.
- K. Product warranties and product bonds.
- L. Maintenance service.
- M. Examination.
- N. Preparation.
- O. Execution.
- P. Cutting and patching.
- Q. Protecting installed construction.
- R. Final cleaning.

1.2 FIELD ENGINEERING

- A. Employ land surveyor registered in State of Texas.
- B. Locate and protect survey control and reference points. Promptly notify Engineer of discrepancies discovered.

- C. Control datum for survey is indicated on Drawings.
- D. Prior to beginning Work, verify and establish floor elevations of existing facilities to ensure that new Work will meet existing elevations in smooth and level alignment except where specifically detailed or indicated otherwise.
- E. Verify setbacks and easements; confirm Drawing dimensions and elevations.
- F. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices.
- G. Submit copy of Site drawing and certificate signed by land surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.
- H. Maintain complete and accurate log of control and survey Work as Work progresses.
- I. On completion of foundation walls and major Site improvements, prepare certified survey illustrating dimensions, locations, angles, and elevations of construction and Site Work.
- J. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.
- K. Promptly report to Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- L. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.

1.3 CLOSEOUT PROCEDURES

- A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:
 - 1. Submit maintenance manuals, Project record documents, and other similar final record data in compliance with this Section.
 - 2. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in compliance with this Section.
 - 3. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
 - 4. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.
 - 5. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.
 - 6. Make final change-over of locks eliminating construction master-key system and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.
 - 7. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.

8. Perform final cleaning according to this Section.
- B. Substantial Completion Inspection:
1. When Contractor considers Work to be substantially complete, submit to Engineer:
 - a. Written certificate that Work, or designated portion, is substantially complete.
 - b. List of items to be completed or corrected (initial punch list).
 2. Within seven days after receipt of request for Substantial Completion, Engineer will make inspection to determine whether Work or designated portion is substantially complete.
 3. Should Engineer determine that Work is not substantially complete:
 - a. Engineer will promptly notify Contractor in writing, stating reasons for its opinion.
 - b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Engineer.
 - c. Engineer will reinspect Work.
 - d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's inspection.
 4. When Engineer finds that Work is substantially complete, Engineer will:
 - a. Prepare Certificate of Substantial Completion on EJCDC C-625 - Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Engineer and Owner (final punch list).
 - b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
 5. After Work is substantially complete, Contractor shall:
 - a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
 - b. Complete Work listed for completion or correction within time period stipulated.
 6. Owner will occupy all of building as specified in Section 01 10 00 - Summary.
- C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.
1. When Contractor considers Work to be complete, submit written certification that:
 - a. Contract Documents have been reviewed.
 - b. Work has been examined for compliance with Contract Documents.
 - c. Work has been completed according to Contract Documents.
 - d. Work is completed and ready for final inspection.
 2. Submittals: Submit following:
 - a. Final punch list indicating all items have been completed or corrected.
 - b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 - c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.

- d. Accounting statement for final changes to Contract Sum.
 - e. Contractor's affidavit of payment of debts and claims on AIA G706 - Contractor's Affidavit of Payment of Debts and Claims.
 - f. Contractor affidavit of release of liens on AIA G706A - Contractor's Affidavit of Release of Liens.
 - g. Consent of surety to final payment on AIA G707 - Consent of Surety to Final Payment Form.
 3. Perform final cleaning for Contractor-soiled areas according to this Section.
- D. Final Completion Inspection:
 1. Within seven (7) days after receipt of request for final inspection, Engineer will make inspection to determine whether Work or designated portion is complete.
 2. Should Engineer consider Work to be incomplete or defective:
 - a. Engineer will promptly notify Contractor in writing, listing incomplete or defective Work.
 - b. Contractor shall remedy stated deficiencies and send second written request to Engineer that Work is complete.
 - c. Engineer will re-inspect Work.
 - d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's inspection.

1.4 STARTING OF SYSTEMS

- A. Coordinate schedule for startup of various equipment and systems.
- B. Notify Engineer seven (7) days prior to startup of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute startup under supervision of manufacturer's representative or Contractors' personnel according to manufacturer's instructions.
- G. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipment or system in operation.
- H. Submit a written report according to Section 01 33 00 - Submittal Procedures that equipment or system has been properly installed and is functioning correctly.

1.5 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of final inspection.

- B. Demonstrate Project equipment and instructed by authorized manufacturer's representative who is knowledgeable about the Project.
- C. Video Recordings: Provide high-quality color video recordings of demonstration and instructional sessions. Engage commercial videographer to record sessions. Include classroom instructions, demonstrations, board diagrams, and other visual aids. Include menu navigation.
- D. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- F. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- G. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- H. Required instruction time for each item of equipment and system is specified in individual Specification Sections.

1.6 TESTING, ADJUSTING, AND BALANCING

- A. Contractor will appoint, employ, and pay for services of independent firm to perform testing, adjusting, and balancing.
- B. Submitted report by independent firm to Engineer indicating observations and results of tests and indicating compliance or noncompliance with requirements of Contract Documents.

1.7 PROJECT RECORD DOCUMENTS

- A. Maintain on Site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, product data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:

1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates used.
 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction as follows:
1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
 2. Include locations of concealed elements of the Work.
 3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
 4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
 5. Identify and locate existing buried or concealed items encountered during Project.
 6. Measured depths of foundations in relation to finish first floor datum.
 7. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 8. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 9. Field changes of dimension and detail.
 10. Details not on original Drawings.
- G. Submit marked-up paper copy documents to Engineer with claim for final Application for Payment.
- H. Submit PDF electronic files of marked-up documents to Engineer with claim for final Application for Payment.

1.8 OPERATION AND MAINTENANCE DATA

- A. Submit in PDF composite electronic indexed file.
- B. Submit data bound in 8-1/2 x 11-inch text pages, three D side ring binders with durable plastic covers.
- C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project, and subject matter of binder when multiple binders are required.
- D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- F. Contents: Prepare table of contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided alphabetically. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:

- a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 - g. Safety precautions to be taken when operating and maintaining or working near equipment.
3. Part 3: Project documents and certificates, including the following:
 - a. Shop Drawings and product data.
 - b. Air and water balance reports.
 - c. Certificates.
 - d. Originals of warranties and bonds.

1.9 MANUAL FOR MATERIALS AND FINISHES

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
- B. For equipment or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit two sets of revised final volumes within ten days after final inspection.
- E. Submit in PDF composite electronic indexed file of final manual within ten days after final inspection.
- F. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom-manufactured products.
- G. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- H. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.
- I. Additional Requirements: As specified in individual product Specification Sections.
- J. Include listing in table of contents for design data, with tabbed fly sheet and space for insertion of data.

1.10 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy will be reviewed and returned after final inspection, with Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit two sets of revised final volumes within ten days after final inspection.
- E. Submit in PDF composite electronic indexed file of final manual within ten days after final inspection.
- F. Each Item of Equipment and Each System: Include description of unit or system and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
- G. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; by label machine.
- H. Include color-coded wiring diagrams as installed.
- I. Operating Procedures: Include startup, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and special operating instructions.
- J. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- K. Include servicing and lubrication schedule and list of lubricants required.
- L. Include manufacturer's printed operation and maintenance instructions.
- M. Include sequence of operation by controls manufacturer.
- N. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- O. Include control diagrams by controls manufacturer as installed.
- P. Include Contractor's coordination drawings with color-coded piping diagrams as installed.
- Q. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- R. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

- S. Include test and balancing reports as specified in Section 01 40 00 - Quality Requirements.
- T. Additional Requirements: As specified in individual product Specification Sections.
- U. Include listing in table of contents for design data with tabbed dividers and space for insertion of data.

1.11 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Furnish spare parts, maintenance, and extra products in quantities specified in individual Specification Sections.
- B. Deliver to Project Site and place in location as directed by Owner; obtain receipt prior to final payment.

1.12 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers within ten days after completion of applicable item of Work.
- B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.
- C. Verify documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Include table of contents and assemble in three D side ring binder with durable plastic cover.
- F. Submit prior to final Application for Payment.
- G. Time of Submittals:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
 - 2. Make other submittals within ten days after date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual Specification Sections.
- D. Verify that utility services are available with correct characteristics and in correct locations.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.3 EXECUTION

- A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.
- B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
 - 1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
 - 2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.
 - 3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual-effect choices to Engineer for final decision.
- E. Allow for expansion of materials and building movement.
- F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.
 - 1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
 - 2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.
- G. Mounting Heights: Where not indicated, mount individual units of Work at industry recognized standard mounting heights for particular application indicated.

1. Refer questionable mounting heights choices to Engineer for final decision.
 2. Elements Identified as Accessible to Handicapped: Comply with applicable codes and regulations.
- H. Adjust operating products and equipment to ensure smooth and unhindered operation.
- I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

3.4 CUTTING AND PATCHING

- A. Employ skilled and experienced installers to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements affecting:
1. Structural integrity of element.
 2. Integrity of weather-exposed or moisture-resistant elements.
 3. Efficiency, maintenance, or safety of element.
 4. Visual qualities of sight-exposed elements.
 5. Work of Owner or separate contractor.
- C. Execute cutting, fitting, and patching including excavation and fill to complete Work and to:
1. Fit the several parts together, to integrate with other Work.
 2. Uncover Work to install or correct ill-timed Work.
 3. Remove and replace defective and nonconforming Work.
 4. Remove samples of installed Work for testing.
 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- D. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new products according to requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.
- H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- I. At penetrations of fire-rated walls, partitions, ceiling, or floor construction, completely seal voids with fire-rated material according to Section 07 84 00 - Firestopping, to full thickness of penetrated element.
- J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.
- K. Identify hazardous substances or conditions exposed during the Work to Engineer for decision or remedy.

3.5 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual Specification Sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Use durable sheet materials to protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

3.6 FINAL CLEANING

- A. Execute final cleaning prior to final Project assessment.
 - 1. Employ experienced personnel or professional cleaning firm.
- B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces.
- C. Clean equipment and fixtures to sanitary condition with appropriate cleaning materials.
- D. Replace filters of operating equipment.
- E. Clean debris from roofs, gutters, downspouts, and drainage systems.
- F. Clean Site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from Site.

END OF SECTION 01 70 00

SECTION 01 70 40 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Compile specified warranties and bonds.
- B. Co-execute submittals when so specified.
- C. Review submittals to verify compliance with Contract Documents.
- D. Submit to the ENGINEER for review and transmittal to OWNER.

1.2 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Number of Copies: Submit six (6) copies of each submittal, unless otherwise indicated. ENGINEER will return two (2) copies.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
 - 1. Product or work item.
 - 2. Firm, with name of principal, address and telephone number.
 - 3. Scope.
 - 4. Date of beginning of warranty, bond or service and maintenance contract.
 - 5. Duration of warranty, bond or service maintenance contract.
 - 6. Provide information for OWNER'S personnel:
 - a. Proper procedure in case of failure.
 - b. Instances that might affect the validity of warranty or bond.
 - 7. CONTRACTOR, name of responsible principal, address and telephone number.

1.3 FORMS OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 - 1. Size 8-1/2 in. x 11 in., punch sheets for standard 3-post binder.
 - a. Fold larger sheets to fit into binders.
 - 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS".
List:
 - a. Title of Project.
 - b. Name of CONTRACTOR.

- C. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum post width of two (2) inches.

1.4 WARRANTY SUBMITTAL REQUIREMENTS

- A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with the CONTRACTOR'S for one (1) year, unless otherwise specified, commencing at the time of final acceptance by the OWNER.
- B. The CONTRACTOR shall be responsible for obtaining certificates for equipment warranty for all major equipment specified. The CONTRACTOR shall still warrant equipment not considered to be "major" in the CONTRACTOR'S one (1) year warranty period even though certificates of warranty may not be required.
- C. For certain pieces of equipment, the OWNER may require a warranty of longer duration. The requirement for a warranty of longer duration shall be specified in individual sections of the Specifications.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. CONTRACTOR shall maintain and provide the OWNER with project record documents as specified below.
- B. Maintenance of Documents
 - 1. Maintain in CONTRACTOR's field office in clean, dry, legible condition complete sets of the following: Contract Drawings, Specifications, Addenda, approved Shop Drawings, Samples, Photographs, Change Orders, other Modifications of Contract, Test Records, Survey Data, Field Orders, and all other documents pertinent to CONTRACTOR's Work.
 - 2. Provide files and racks for proper storage and easy access. File in accordance with filing format of Construction Specification Institute (CSI) unless otherwise approved by OWNER.
 - 3. Make documents available at all times for inspection by OWNER.
 - 4. Record documents shall not be used for any other purpose and shall not be removed from the office without OWNER's approval.
- C. Recording
 - 1. Label each document "PROJECT RECORD" in 2-inch high printed letters.
 - 2. Keep record documents current and updated at least weekly.
 - 3. Do not permanently conceal any Work until required information has been recorded.
 - 4. Contract Drawings - Legibly mark to record actual construction including:
 - a. Depths of various elements of manhole foundation in relation to datum.
 - b. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 - c. Field changes of dimensions and details.
 - d. Changes made by Change Order or Field Order.
 - e. Details not on original Contract Drawings.
 - f. Changes of different method of construction.
 - g. Use of different products not specified
 - 5. Specifications and Addenda - Legibly mark up each Section to record:
 - a. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 - b. Changes made by Change Order or Field Order.
 - c. Other matters not originally specified.
 - 6. Shop Drawings - Maintain as record documents and legibly annotate drawings to record changes made after review.
 - 7. Record Documents will be reviewed by the OWNER and the CONTRACTOR on a monthly basis and failure to keep documents accurate and current will be basis for the OWNER to withhold the CONTRACTOR's monthly payment in partial or full.
- D. Record Drawings
 - 1. Record drawings shall reflect completion of the installation of all equipment, piping, and other work by the CONTRACTOR. The drawings shall show the Work in plan and sections as required for clarity with reference dimensions and elevations for complete record

drawings. The drawings shall be furnished not later than 30 days after completion of the Work and prior to final payment.

2. The Contract Drawings may be used as a starting point in developing these drawings. Subcontractor and manufacturer drawings may be included in this drawing package. The drawing package must be fully integrated and include the necessary cross references between drawings. The drawing package shall include interconnection, numbering, and termination details to equipment furnished under this Contract.

E. Submittal

1. At project completion, deliver record documents to the OWNER. Place all letter-sized material in a three (3) ring binder, which is neatly indexed by process and division number. Bind Contract drawings and shop drawings in rolls of convenient size for ease of handling.
2. Accompany the submittal with a transmittal letter in duplicate containing the following:
 - a. Date.
 - b. Project title and number.
 - c. CONTRACTOR's name and address.
 - d. Title and number of each record document.
 - e. Certification that each document as submitted is complete and accurate.
 - f. Signature of CONTRACTOR.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 78 39

SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

- A. Providing concrete reinforcement.
- B. Providing accessories.

1.2 REFERENCE STANDARDS

- A. American Concrete Institute
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 315R - Guide to Presenting Reinforcing Steel Design Details.
 - 3. ACI 318 - Building Code Requirements for Structural Concrete.
- B. ASTM International
 - 1. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - 2. ASTM A706 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
 - 3. ASTM A884 - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
 - 4. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- C. American Welding Society
 - 1. AWS D1.4 - Structural Welding Code – Steel Reinforcing Bars
- D. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."

1.3 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Requirements for submittals.
- B. Steel Reinforcement Shop Drawings: Placing drawings detailing fabrication, bending, sizes, spacing, and placement, including rebar and formwork accessories.
- C. Material certificates

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the provisions of the referenced codes specifications and standards, except where more stringent requirements are show or specified.

- B. Use adequate numbers of skilled technicians who are thoroughly trained and experienced, and certified, where applicable and required, in the necessary crafts, and who are completely familiar with the specified requirements and the methods needed for proper performance of the work.

1.5 DELIVERY & PROTECTION

- A. Deliver reinforcement as required.
- B. Deliver reinforcement bundled, tagged, and marked. Markings shall conform to those on reviewed Shop Drawings.
- C. Store reinforcing materials at site in such a manner as to prevent damage and accumulation of dirt. Reinforcement shall be clean at time of concrete placement.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed.
- B. Galvanized Reinforcing Bars: ASTM A615, Grade 60 zinc-coated after fabrication and bending.
- C. Epoxy-Coated Reinforcing Bars: ASTM A615, Grade 60, epoxy-coated, with less than 2 percent damaged coating in each 12-inch bar length.
- D. Plain-Steel Welded-Wire Reinforcement: ASTM A1064, plain, fabricated from as-drawn steel wire into flat sheets.
- E. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064, flat sheet.
- F. Galvanized-Steel Welded-Wire Reinforcement: ASTM A1064, plain, fabricated from galvanized -steel wire into flat sheets.
- G. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884, Class A coated, Type 1, steel.
- H. Tie Wire: 16 gauge black iron wire.
- I. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."
- J. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
- K. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.2 FABRICATION

- A. Shop fabricate bars to conform to required shapes and dimensions, and in accordance with CRSI's "Manual of Standard Practice." Tolerances shall comply with ACI 315R. Do not re-bend or straighten reinforcement in a manner that will weaken reinforcement or damage concrete.

PART 3 - EXECUTION

3.1 PLACING OF REINFORCING BARS

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Reinforce concrete where and as indicated on drawings.
- C. Clean, bend, splice and place metal reinforcements in accordance with the references. Wire intersections together as required to eliminate displacement.
- D. Remove all dirt, mud, rubbish, hardened concrete, and other debris from reinforcing bars and forms prior to placing new concrete.
- E. Position reinforcement accurately and secure rigidly against displacement. Support bars on a sufficient number of approved chairs or spacers. Fasten bars where they intersect with tie wire.
- F. Do not cut or puncture vapor retarder. Repair any damage and reseal vapor retarder before placing concrete.
- G. Lap end and sides of adjoining sheets of fabric reinforcement, and wire together on 18" centers. Lap ends and sides one (1) mesh spacing or minimum of 6".
- H. Lap of bars shall be as required by ACI 318. Splices shall be wired together tightly.
- I. Do not use installed reinforcement as a base for runways for concrete conveying equipment or similar construction loads.

END OF SECTION 03 20 00

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SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 REFERENCE STANDARDS

- A. American Concrete Institute (ACI):
 - 1. ACI 117 - Specification for Tolerances for Concrete Construction and Materials.
 - 2. ACI 301 - Specifications for Structural Concrete.
 - 3. ACI 302.1R - Guide for Concrete Floor and Slab Construction.
 - 4. ACI 305.1 - Specification for Hot Weather Concreting.
 - 5. ACI 306.1 - Standard Specification for Cold Weather Concreting.
 - 6. ACI 308.1 - Specification for Curing Concrete.
 - 7. ACI 318 - Building Code Requirements for Structural Concrete.
 - 8. ACI 347R - Guide to Formwork for Concrete.
 - 9. ACI 350 - Code Requirements for Environmental Engineering Concrete Structures.
- B. ASTM International:
 - 1. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - 2. ASTM A706 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
 - 3. ASTM A884 - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
 - 4. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - 5. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 6. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 7. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 8. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - 9. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
 - 10. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete.
 - 11. ASTM C150 - Standard Specification for Portland Cement.
 - 12. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
 - 13. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
 - 14. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
 - 15. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

16. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
17. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
18. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
19. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
20. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
21. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
22. ASTM C685 - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.
23. ASTM C845 - Standard Specification for Expansive Hydraulic Cement.
24. ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.
25. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
26. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
27. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
28. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
29. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete.
30. ASTM C1157 - Standard Performance Specification for Hydraulic Cement.
31. ASTM C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
32. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
33. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
34. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
35. ASTM D1752 - Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
36. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
37. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
38. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
39. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: For each type of product.
- C. Design Mixtures: For each concrete mixture.
- D. Material certificates and test reports.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified Professional Engineer licensed in the State of Texas, detailing fabrication, assembly, and support of formwork.

- F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the provisions of the referenced codes, specifications, and standards, except where more stringent requirements are shown or specified.
- B. Perform Work according to the reference standards.
- C. Use adequate numbers of skilled technicians who are thoroughly trained and experienced, and certified, where applicable and required, in the necessary crafts, and who are completely familiar with the specified requirements and methods needed for proper performance of the work.
- D. Comply with ACI 305.1 when pouring concrete during hot weather.
- E. Comply with ACI 306.1 when pouring concrete during cold weather.
- F. Acquire cement and aggregate from one source for Work.
- G. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's Certification of Production Facilities.
- H. Testing Agency Qualifications: An independent agency, qualified according to ASTM C1077 and ASTM E 329 for testing indicated.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Coordinate with testing agency to perform preconstruction testing on concrete mixtures. Refer to Special Inspection testing requirements.

1.6 FIELD CONDITIONS

- A. Maintain concrete temperature after installation at minimum 50 degrees F for minimum seven days.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

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

2. ACI 117.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Form Coatings: Provide commercial formulation form-coating compounds with a maximum VOC of 350 mg/l that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
- D. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units that will leave no metal closer than 1-1/2" to exposed surface. Provide watertight snap-ties for liquid holding structures.

2.3 CONCRETE MATERIALS

- A. Cementitious Materials
 1. Portland Cement: ASTM C150, Type I/II.
 2. Fly Ash: ASTM C618, Class F.
 3. Use one brand of cement throughout project unless otherwise acceptable to Engineer.
 4. Type II Cement shall be used in slab-on-grade.
- B. Normal-Weight Aggregates: ASTM C33, graded.
 1. Maximum Coarse-Aggregate Size: According to ACI 318.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Lightweight Aggregate: ASTM C330, maximum size per ACI 318.
- D. Water: ASTM C94 and potable without deleterious amounts of chloride ions.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Air-Entraining Admixture: ASTM C260.
 2. Water-Reducing Admixture: ASTM C494, Type A.
 3. Retarding Admixture: ASTM C494, Type B.
 4. Accelerating Admixture: ASTM C494, Type C.
 5. Water-Reducing and Retarding Admixture: ASTM C494, Type D.
 6. Water Reducing and Accelerating Admixture: ASTM C494, Type E
 7. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
 8. High-Range, Water-Reducing and Retarding Admixture: ASTM C494, Type G.
 9. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

10. Corrosion-Inhibiting Admixture: ASTM C494, for use in resisting corrosion of steel reinforcement.

- F. Admixture Manufacturers
 1. Sika Corp.
 2. WR Grace Co.
 3. Euclid Chemical Co.
 4. Or approved equal.

2.4 FIBER REINFORCEMENT

- A. Synthetic Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C1116, Type III.
- B. Synthetic Micro-Fiber: Fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C1116, Type III.

2.5 CURING MATERIALS AND SEALING COMPOUNDS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182 (Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats), Class 2, burlap cloth made from jute or kenaf, weighing approximately 8 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C309, Type 1, Class A. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.
 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
 - a. "Kure-N-Seal WB," Sonneborn-Rexnord.
 - b. "Dress & Seal WB," L & M Construction Chemicals
 2. Do not apply sealers to concrete surfaces scheduled to receive floor systems or finish coatings.
- F. Interior/Exterior Exposed Concrete Slabs shall comply with the following:
 1. Use a one-component penetrating sealer which shall be a one-part liquid, composed of a minimum of 40% silane or siloxane material, with no petroleum distillates, and which does not alter the color or texture of concrete floors..
 2. Prepare surface according to manufacturer's recommendations.
 3. First Coat: ChemMasters, Inc. "Aquanil Plus 40A" or approved equal.
 4. Second Coat: Repeat first coat.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-impregnated fiberboard or felt. Thickness as per plans or 1/2" minimum where not specified.

2.7 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial batch or field test data, or both, according to ACI 301.
- B. Pozzolans:
1. Maximum amount allowed: 20% of total cement plus pozzolan weight.
 2. Fly ash replacement for cement shall be a 1.2:1 ratio.
 3. Fly ash supplier shall be on the Texas Department of Transportation's current "Approved List of Suppliers of Fly Ash".
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.8 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Use Normal-Weight Concrete unless noted and specified otherwise.
- B. Prepare design mixes for each type and strength of concrete, proportioned on the basis of laboratory trial batch or field test data, or both, according to ACI 301. If trial batch method is used, use an independent testing facility acceptable to Engineer for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.
- C. Submit written reports to Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until proposed mix designs have been reviewed and approved by Engineer.
- D. Mix parameters:

Element	28 Day Strength	Air Content	Course Aggre- gate	Initial Max. Slump	Notes
Footings	4,000 psi	4%-6%	#56	3"	
Foundation Walls & Piers	4,000 psi	4%-6%	#56	4"	

Interior Walls, Beams & Columns	4,000 psi	N/A	#56	4"	
Exterior Slabs	4,000 psi	6%-8%	#56	3"	a, c, f
Interior Slabs	4,000 psi	OPT.	#56	3"	a, b, c, d, e, f
Fill Concrete	2,000 psi	OPT.	#67	4"	

Notes:

- a. Use Type II cement.
 - b. A vibratory screed shall be used for these slabs. This requirement may be relaxed (as approved by the Structural Engineer) if a HRWR is used.
 - c. Mixing water for this concrete shall be limited to 250 lbs. per cubic yard. Workability shall be obtained by methods other than the addition of water.
 - d. A gradation analysis of the coarse aggregate shall be submitted with the mix design. A minimum of 5% shall be retained on a 1" sieve.
 - e. A gradation analysis of the coarse aggregate shall be submitted with the mix design. A minimum of 5% shall be retained on a 3/4" sieve.
 - f. If a high range water reducer (HRWR) is used to improve workability then the maximum slump limits may be relaxed as approved by the Structural Engineer.
- E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in work.
- F. Pump mixes: Maximum water/cement ratios must be maintained. If additional workability is required for pumped placement, high or mid-range water reducers shall be used in lieu of additional water.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 °F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 °F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.4 WATERSTOP INSTALLATION

- A. Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions.

3.5 CONCRETE PLACEMENT

- A. Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.
- B. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete. Verify concrete cover over reinforcement. Verify that required inspections are completed.

- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete according to ACI 301.
 - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
 - 1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 - 3. Maintain reinforcing in proper position during concrete placement.

3.6 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum number of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 - 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part Portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white Portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub

- grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part Portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white Portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.7 FINISHING FLOORS AND SLABS

- A. General
1. Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces.
 2. Do not wet concrete surfaces.
 3. Surface plane shall meet tolerances for floor flatness (Ff) of 20 and floor levelness (Fl) of 17.
 4. Slope surfaces uniformly to drains where indicated.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
1. Apply scratch finish to surfaces to receive concrete mortar setting beds for tile, Portland cement terrazzo, and other bonded cementitious floor finish material, and as otherwise indicated.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces to receive trowel finish and slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or as otherwise specified.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.
- G. Sealing, priming, and finish covering preparation
 - 1. Refer to Section 2.5 and finish schedule, if available, for requirements.

3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears, using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage that occurs during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial

application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage that occurs during curing period.

5. Contractor shall verify compatibility of all surface applied evaporation retarders, curing compounds, sealers, and other coatings with final surface finishes.

3.9 SHORES AND SUPPORTS

- A. General: Comply with ACI 347.2R "Guide for Shore/Reshoring of Concrete Multistory Buildings" for shoring and reshoring in multistory construction, and as herein specified.
- B. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to support work without excessive stress or deflection.
- C. Keep shores in place a minimum of 15 days after placing upper tier, and longer if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.10 REMOVAL OF FORMS

- A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50°F (10°C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed before 14 days after placing concrete and until concrete has attained at least 75% of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

3.11 REUSE OF FORMS

- A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces except as acceptable to Engineer.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

- B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Engineer.
 - 1. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar before bonding compound has dried.
 - 2. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry-pack mortar, or precast cement cone plugs secured in place with a bonding agent.
 - 1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- D. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having required slope.
 - 1. Repair finished unformed surfaces that contain defects that affect the durability of the concrete. Surface defects, as such, include crazing and cracks in excess of 0.01" wide or that penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop outs, honeycomb, rock pockets, and other objectionable conditions.
 - 2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
 - 3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with patching compound. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Engineer.

- E. Perform structural repairs with prior approval of Engineer of procedure, using specified epoxy adhesive and mortar.

3.14 FIELD QUALITY CONTROL DURING CONSTRUCTION

- A. Special Inspections: Owner will engage a Special Inspector and certified testing and inspecting agency to perform field tests and inspections and prepare test reports. The testing service shall be independent and shall not be affiliated with the concrete supplier or Contractor.
- B. Sampling and testing for quality control during placement of concrete will be in accordance with Section 01 45 33 - Special Inspections.
- C. Non-destructive Testing: Impact hammer, sonoscope, or other non-destructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- D. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer or Owner's representative. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified at no cost to Owner.
- E. Concrete trucks exceeding ninety (90) minutes from the time the truck is loaded at the batch plant to the time the truck is ready to unload at the site may be rejected by the Owner's on-site representative. The Special Inspector shall notify the Owner's on-site representative upon discovery of any trucks exceeding the above-mentioned time.
- F. Test results will be reported in writing to Engineer, Owner's Representative, ready-mix producer, and Contractor within 24 hours. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

END OF SECTION 03 30 00

SECTION 09 90 00 - COATING SYSTEM FOR STEEL WATER STORAGE TANKS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work of this section includes the coating of all interior surfaces, and the painting of all exterior surfaces of the 100,000-gallon Stand Pipe Storage Tank for the City of Killeen.

1.2 REFERENCE SPECIFICATIONS AND STANDARDS

- A. Without limiting the general aspects of other requirements of these specifications, all surface preparation, coating and painting of interior and exterior surfaces and inspection shall conform to the applicable requirements of the Society for Protective Coatings, NACE International, ASTM (American Society for Testing and Materials), AWWA and the manufacturer's printed instructions.
1. ASTM (American Society for Testing and Materials)
 - a. ASTM D 520 Standard Specification for Zinc Dust Pigment
 - b. ASTM D 4417 Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
 - c. ASTM E 337 Standard Practice Test Method for Measuring Humidity with a Psychrometer
 - d. ASTM D2200 Standard Methods of Evaluating Degree of Rusting on Painted Surfaces
 2. ANSI (American National Standards Institute)
 - a. ANSI/ASC 29.4 Exhaust Systems Abrasive Blasting Operations – Ventilation and Safe Practice
 - b. ANSI/NSF Standard 61 Drinking Water Components
 3. AWWA (American Water Works Association)
 - a. AWWA D 102 Coating Steel Water Storage Tanks
 4. Consumer Product Safety Act, Part 1303
 5. NACE International
 - a. NACE Publication TPC2 Coatings and Linings for Immersion Service: Chapter 1 Safety, Chapter Surface Preparation, Chapter 3 Curing, and Chapter 4 Inspection
 - b. NACE Standard SP0178 Standard Recommended Practice – Fabrication Details, Surface Finish Requirements and Proper Design

- c. NACE Standard SP0188
 - d. NACE Standard SP0287
 - e. NACE Standard SP0288
 - 6. OSHA (Occupational Safety & Health Administration)
 - a. 1915.35 Standards – 29 CFR – Painting
 - 7. SSPC (Society for Protective Coatings)
 - a. SSPC-SP1 Solvent Cleaning
 - b. SSPC-SP2 Hand Tool Cleaning
 - c. SSPC-SP3 Power Tool Cleaning
 - d. SSPC-SP11 Power Tool Cleaning to Bare Metal
 - e. SSPC-PA 1 Shop, Field and Maintenance Painting
 - f. SSPC-PA 2 Measurement of Dry Film Thickness with Magnetic Gages
 - g. SSPC-PA 3 Guide to Safety in Paint Application
 - h. SSPC-PA 11 Protecting Edges, Crevices, and Irregular Steel Surfaces by Stripe Coating
 - i. SSPC-Guide 12 Guide for Illumination of Industrial Painting Project
 - j. SSPC-VIS 1-89 Pictorial Surface Preparation Standards for Painting Steel Surfaces
 - k. SSPC Paint Spec 36 Two Component Weatherable Aliphatic Polyurethane Topcoat, Performance-Based
 - 8. SSPC/NACE Joint Standards
 - a. SSPC-SP5/NACE 1 White Metal Blast Cleaning
 - b. SSPC-SP6/NACE 3 Commercial Blast Cleaning
 - c. SSPC-SP7/NACE 4 Brush-Off Blast Cleaning
 - d. SSPC-SP10/NACE 2 Near-White Metal Blast Cleaning
 - e. SSPC-WJ-4/NACE WJ-4 Waterjet Cleaning of Metals
- B. The Engineer's and or Inspector's decision shall be final as the interpretation and/or conflict between any of the referenced specifications and standards contained herein.

1.3 CONTRACTOR

- A. The Contractor shall have five-years practical experience and successful history in the application of specified product to surfaces of steel water tanks. Upon request, he shall substantiate this requirement by furnishing a list of references and job completions.

- B. The Contractor shall submit with his bid a written statement by the coatings manufacturer stating that the Contractor is familiar with the materials specified and has workers capable of performing the work specified herein.
- C. The personnel performing the work shall be knowledgeable and have the required experience and skill to adequately perform the work for this project, in accordance with SSPC-PA1, "Shop, Field and Maintenance Painting".
- D. The Contractor is responsible for all claims for any damage during the progress of the tank rehabilitation and is especially forewarned of this responsibility so that he may exert all possible precaution and care for protection of property while under construction.
- E. The contractor shall protect the public from harm caused by the Contractor's actions and performance of the work. Prior to the start of work or mobilization on site, the Contractor shall submit a site-specific Public Safety Plan based on the Contractor's selected work methods. The plan shall include necessary plans and measures to protect the general public from harm. Safety signs, warning signs, protective barriers and safety warning devices for daylight and nighttime protection shall be installed.
- F. When not working on the tank or site (such as during the evening, weekends, holidays, or bad weather days), the Contractor shall secure all openings in the tank, the exterior pedestal doors and access or rigging devices. The Contractor shall lock the site fencing, equipment and supply storage containers. The Contractor shall be solely responsible for the security of the site, tank, equipment and supplies during working and non-working hours.

1.4 SUBMITTALS

- A. Submit coating manufacturer's product data sheets and material safety data sheets for all coating materials to be applied to the tank. Provide a color card/book for the exterior finish coat.
- B. Submit abrasive manufacturers' product data sheets and material safety data sheets for all abrasive materials to be used on the tank. Provide a letter from the abrasive supplier stating that the submitted abrasive is appropriate for the application.

1.5 QUALITY ASSURANCE

- A. General: Quality assurance procedures and practices shall be utilized to monitor all phases of surface preparation, application and inspection throughout the duration of the project. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and accepted professional standards and are approved by the Engineer.
- B. Surface Preparation: Surface preparation will be based upon comparison with: "Pictorial Surface Preparation Standards for Painting Steel Surfaces: SSPC-VIS 1, ASTM D2200, "Standard Methods of Evaluating Degree of Rusting on Painted Surfaces".
- C. Surface profile shall be measured in accordance with ASTM D 4417, Method B and/or Method C or NACE Standard SP0287. The number of surface profile readings to be taken shall be as proscribed in SSPC-PA 2, Section 8 regarding the number of dry film readings. In all cases the written standard shall take precedence over the visual standard.

- D. NACE Standard SP0178, along with the Visual Comparator, shall be used to verify the surface preparation of welds.
- E. Prior to undertaking full-scale abrasive blasting operations, the contractor shall perform a test blast on both the exterior and the interior of the tank in the presence of the Engineer or his representative. The test section shall be a minimum of five (5) feet high by five (5) feet wide. The Engineer or his representative shall verify that the surface cleanliness and profile meet the requirements of this specification before work is allowed to proceed. In the event the test section fails to comply with the requirements of this specification, the contractor shall be required to make suitable changes to the equipment and/or abrasive material and perform an additional test sections until compliance with the specification is demonstrated.
- F. Application: No coating or paint shall be applied when: 1) the surrounding air temperature or the temperature of the surface to be coated or painted is below the minimum surface temperature for the products specified herein, 2) rain, snow, fog or mist is present, 3) the surface temperature is less than 5°F above the dew point, 4) the air temperature is expected to drop below the minimum temperature for the products specified within six hours after application of coating. Dewpoint shall be measured by use of an instrument such as a Sling Psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychrometric Tables. If any of the above conditions are prevalent, coating or painting shall be delayed or postponed until conditions are favorable. The day's coating or painting shall be completed in time to permit the film sufficient drying time prior to damage by atmospheric conditions.
- G. Coating Thickness: Thickness of coatings and paint shall be measured checked according to the procedures outlined in SSPC-PA 2 "Measurement of Dry Film Thickness with Magnetic Gages". Dry film thickness shall be a Level 2 as defined in Paragraph 9.2, excepting that no single gage reading shall be less than 80% of the specified dry film thickness. Areas that fail to meet these criteria shall be corrected at no expense to the Owner. Use of an instrument such as a Tooke Gauge, precision groove grinder, etc. is permitted if a destructive test is deemed necessary by the Engineer and the total DFT is less than 50 mils.

The below paragraph calls for all interior surfaces to be checked for holidays. This shall include the interior roof as well. Inaccessible areas such as the space between rafters and roof plates and lapped roof plates are exempted from this requirement.

- H. Holiday (Pinhole) Testing: The integrity of interior coated surfaces shall be tested for holidays in accordance with NACE Standard SP0188. For dry films less than 20 mils, a non-destructive holiday detector shall not exceed 67.5 volts, nor shall destructive holiday detector exceed the voltage recommended by the manufacturer of the coating system. A solution of 1-ounce non-sudsing type wetting agent, such as Kodak Photo-Flo, and 1 gallon of tap water shall be used to perform the holiday testing. For coating thickness at 20 mils and greater, a high voltage Tinker & Razor AP/W holiday tester shall be used. Contact coating manufacturer for voltage recommendations and curing parameters.
- I. All pinholes and/or holidays shall be marked and repaired in accordance with the manufacturer's printed recommendations and retested. No pinholes or other irregularities will be permitted in the final coating.
- J. Inspection Devices: The contractor shall furnish, until final acceptance of coating and painting is accepted, inspection devices in good working condition for detection of holidays and measurement of dry film thickness of coating and paint. The Contractor shall also furnish U.S. Department of

Commerce, National Bureau of Standards certified thickness calibration plates and/or plastic shims, depending upon the thickness gauge used, to test the accuracy of dry film thickness gauges and certified instrumentation to test the accuracy of holiday detectors. Dry film gauges and holiday detectors shall be made available for the Engineer's use at all times until final acceptance of application. Holiday detection devices shall be operated in the presence of the Engineer.

- K. Inspection: The Owner/Engineer will retain the services of HOT Inspection Services, Inc., a tank inspection and consulting firm that will provide an independent AWS Certified Welding Inspector and NACE Certified Coating Inspector for quality control of welding techniques, preparation of steel, and coatings applications in the field (on-site). Contractor is responsible for providing access to tank, communicating work progress, and coordinating inspection services with Owner's independent consultant. The inspection company shall report to the engineer. The inspector shall communicate directly with the CONTRACTOR'S SUPERINTENDENT. Final inspections shall be performed in the presence of the ENGINEER, OWNER or their representative and the CONTRACTORS SUPERINTENDENT. All materials and equipment used in the accomplishment of testing are subject to inspection at any time by the ENGINEER, OWNER and/or INSPECTOR. The CONTRACTOR shall not move or remove scaffolding, ladders or other fixtures necessary to provide proper inspection until such work has been inspected and approved by the INSPECTOR and/or the ENGINEER/OWNER.
1. Inspection for this project shall consist of 'hold point' inspections. The ENGINEER/OWNER'S INSPECTOR shall inspect the surface prior to abrasive blasting, after abrasive blasting but prior to application of coating materials, and between subsequent coats of material. Final inspection shall take place after all coatings are applied, but prior to placing the tank in service. Contractor will insure that sufficient rigging is in place so that the ENGINEER/OWNER'S INSPECTOR shall be able to conduct the required inspections.
 2. The shop fabrication and welding operations shall be inspected and all material pertaining to the tank must be shop inspected by the inspector after surface preparation and prior to the pre-construction primer application before shipping to the project site. The inspector shall be an independent AWS Certified Welding Inspector and NACE Level III Certified Coating Inspector hired by the Contractor and approved by the owner/engineer. All inspection reports shall be submitted to the owner/engineer for review and approval. If the Contractor utilizes the services of the Engineer/Owner's Inspector, all expenses incurred for transportation, lodging and labor for inspections on work done at a location, such as for shop welding, surface preparation and coating work, other than the project work site shall be paid for by the Contractor. Coordination and scheduling efforts shall be considered to maximize the inspection productivity. The Owner's inspector shall be notified at least 10 days in advance of the time the inspection will be needed.
- L. First Anniversary Inspection: The First Anniversary Inspection as described in Section 5.2 of AWWA D102-17 shall apply. The Inspection shall be scheduled during the eleventh month following acceptance of all coating and painting work. All defective work shall be repaired in accordance with this specification, AWWA D102, unless otherwise specified here within. All defective work shall be repaired to the satisfaction of the Engineer and/or Owner. The Contractor's Performance Bond or separate Maintenance Bond shall be in force until after remedial work is performed. The Contractor shall warranty all repair work for one year.
1. Interior surfaces of the reservoir shall be inspected within 12 months after the reservoir work has been accepted and placed in service. If an inspection date has not been established within 13 months after the reservoir has been placed in service, the anniversary inspection shall be considered waved, except in the event the OWNER is unable to remove the reservoir

- from service due to extremely long dry climate conditions or otherwise adverse weather conditions or due to unexpected breakdowns in the OWNER's distribution system. The date of anniversary inspection may be extended for a period of time not to exceed twenty-four (24) months beyond the date of final completion and acceptance of the work.
2. If failures in any portion of the reservoir surface, exceed five (5) percent of that portion, as determined by the OWNER, then for that portion, the entire coating system shall be completely removed, re-coated and re-tested in accordance with the specifications herein. In the event any portion of the reservoir surface requires complete repair as provided herein, a second anniversary inspection shall be made unless the OWNER otherwise deems it not to be necessary. If subsequent anniversary inspections are to be made, time stipulations, coating removal, repair, re-testing and anniversary inspection requirements shall be the same as provided for in this specification.
 3. The OWNER will isolate the reservoir from the distribution system and drain the reservoir. The CONTRACTOR shall open, clean out, high-pressure water wash and rinse the tank prior to anniversary inspection. After inspection of the tank is complete, the CONTRACTOR shall disinfect the reservoir and properly seal the tank prior to placing it into service, with no charge to the OWNER. Disinfection of the tank, after anniversary inspection, shall be as per disinfection procedures stated in Section 3.05 of this specification.
 4. The CONTRACTOR shall provide suitable and adequate equipment including: lighting, ventilation, rigging, cable climbers, mirrors, inspection equipment, and sufficient manpower to clean, disinfect and move equipment and tools around the tank, etc., as may be necessary to facilitate complete inspection of all interior surfaces. The CONTRACTOR shall bear all costs of the anniversary inspection and shall incorporate such costs into his bid. This shall include the owner's 3rd party inspector's fees.
 5. Any location, including but not limited to locations where a coating has peeled off, bubbled, blistered, chipped, or cracked, etc., or where pinholes and/or holidays are present and locations where rusting or corrosion is evident, will be considered a failure or defect of the coating system and shall be repaired as required. Repairs will be made at areas or locations where coating failures are found.
 6. Methods of testing for coating failure which, may or may not be evident, shall include, but not be limited to, adhesion tests, film thickness measurement, holiday testing, etc. Testing may be non-destructive or destructive. The CONTRACTOR, at his expense, shall repair all areas where destructive tests are performed.
 7. The anniversary repair work shall be completed within an agreed time period as determined by the OWNER and CONTRACTOR. All repairs shall be made as per the coating manufacturers written repair work instructions or that which is approved and acceptable to the OWNER and completed within ninety (90) calendar days of the anniversary inspection.

The warranty inspection must be scheduled and coordinated by the Engineer or the Owner.

1.6 SAFETY AND HEALTH REQUIREMENTS

- A. General: In accordance with requirements set forth by regulatory agencies applicable to the construction industry and manufacturer's printed instructions and appropriate technical bulletins and manuals, the Contractor shall provide and require use of personal protective lifesaving equipment for persons working on or about the project site. The Contractor's work forces should comply with the provisions outlined in SSPC-PA-3 "A Guide to Safety in Paint Application".
- B. Head and Face Protection and Respiratory Devices: Equipment shall include protective helmets which shall be worn by all persons while in the vicinity of the work. In addition, workers engaged

in or near the work during sandblasting shall wear eye and face protection devices and air purifying half-mask or mouthpiece respirators with appropriate filters. Barrier creams shall be used on any exposed areas of skin.

- C. Ventilation: Where ventilation is used to control hazardous exposure, all equipment shall be explosion-proof. Ventilation shall reduce the concentration of air contaminants to a degree a hazard does not exist. Air circulation and exhausting of solvent vapors shall be continued until coatings have fully cured.
- D. Sound Levels: Whenever the occupational noise exposure exceeds maximum allowable sound levels, the Contractor shall provide and require the use of approved ear protection devices.
- E. Illumination: Adequate illumination shall be provided while work is in progress, including explosion-proof lights and electrical equipment. Whenever required by the Engineer, the Contractor shall provide additional illumination and necessary supports to cover all areas to be inspected. The level of illumination for inspection purposes shall be determined by the Engineer.
- F. Temporary Ladders and Scaffolding: All temporary ladders and scaffolding shall conform to applicable safety requirements. They shall be erected where requested by the Engineer to facilitate inspection and be moved by the Contractor to locations requested by the Engineer.

1.7 PRODUCT DELIVERY, STORAGE & HANDLING

- A. All materials shall be brought to the jobsite in original sealed containers. They shall not be used until the Engineer has inspected the contents and obtained data from information on containers or label. Materials exceeding storage life recommended by the manufacturer shall be rejected.
- B. All coatings and paints shall be stored in enclosed structures to protect them from weather and excessive heat or cold. Flammable coatings and paints must be stored to conform with City, County, State and Federal safety codes for flammable coating or paint materials. At all times coatings and paints shall be protected from freezing.

PART 2 - MATERIALS

2.1 ACCEPTABLE MANUFACTURERS

- A. Materials specified are those that have been evaluated for the specific service. Products of the Tnemec Company, Inc., have been specified for this project. No other paint manufacturers will be allowed for use on this project. The contractor shall make arrangements for the Tnemec representative to attend the pre-construction conference.
- B. Manufacturer's color charts shall be submitted to the Engineer at least 30 days prior to coating and/or paint application. General Contractor and Painting Contractor shall coordinate work so as to allow sufficient time (normally seven to ten days) for paint to be delivered to the job site.

2.2 GENERAL REQUIREMENTS

- A. All materials shall be lead-free as defined by the Consumer Product Safety Act, Part 1303.

- B. All zinc dust pigment contained in any zinc-rich material shall meet the requirements of ASTM D 520 Type III with regard to zinc content and purity.
- C. All materials for the interior wetted portion of the tank shall meet the requirements of ANSI/NSF Standard 61 for potable water contact.
- D. All catalyzed polyurethane products shall meet the minimum requirements of SSPC Paint Specification Number 36, Level 3 Performance Level.
- E. No products containing MOCHA shall be allowed.
- F. No inorganic zinc-rich primers shall be permitted on the tank interior surfaces.

2.3 MATERIAL PREPARATION

- A. Mix and thin materials according to manufacturer's latest printed instructions.
- B. Do not use materials beyond manufacturer's recommended shelf life.
- C. Do not use mixed materials beyond manufacturer's recommended pot life.
- D. Do not split kits of multi-component products.

2.4 SHOP-APPLIED PRE-CONSTRUCTION PRIMER

- A. Surface Preparation Prior to Abrasive Blast Cleaning: Weld flux and spatter shall be removed by power tool cleaning. Sharp projections shall be ground to a smooth contour. All welds shall be ground to a smooth contour as per NACE Standard RP0178 designation "D" and herein.
- B. Surface Preparation: SSPC-SP10 Near-White Metal Blast Cleaning. Anchor profile shall be 1.5 to 2.5 mils as per ASTM D 4417, Method C or NACE Standard RP0287.
- C. Zinc-Rich Primer: Tnemec Series 94-H₂O Hydro-Zinc applied at 1.0 dry mils. Thin only with approved thinner, Tnemec 41-49, Tnemec 41-2 or 41-3 Thinner.

2.5 INTERIOR FIELD-APPLIED COATING SYSTEMS

- A. Tank Interior Coating System - Wet and Dry
 1. Weld Preparation: Weld flux and spatter shall be removed by power tool cleaning. Sharp projections shall be ground to a smooth contour. All welds shall be ground to a smooth contour as per NACE Standard SP0178, Designation D.
 2. Surface Preparation: Surface Preparation: SSPC-SP10 Near-White Metal Blast Cleaning on all bare metal areas (such as weld seams, etc.) and
 3. all shop-primed areas damaged during transportation and erection. Anchor profile shall be 1.5 to 2.5 mils as per ASTM D 4417, Method C or NACE Standard RP0287. All (100%) of shop-primed areas shall be uniformly and thoroughly sweep-blasted as per SSPC-SP7 Brush-Off Blast Cleaning prior to applying coating system. Any bare metal exposed during sweep-blasting shall be prepared as per SSPC-SP10 Near White Metal Blast Cleaning and above.

B. Coating System – Wetted Areas

1. 1st Coat: Tnemec Series 94-H2O Hydro-Zinc applied at 2.5 to 3.5 dry mils. Thin only with approved thinner, Tnemec 41-3 or 41-49 Thinner.
2. Stripe Coat: Tnemec Series N140F Pota-Pox Plus (1255 Beige) applied by brush and scrubbed into all weld seams. In addition to weld seams, all edges, corners, bolts, pits shall receive a stripe coat. This shall be a separate step. The 2nd coat or subsequent coat shall not be applied until the recoat time has been achieved. Thin only as instructed in manufacturers data sheets.
3. 2nd Coat: Tnemec Series N140F Pota-Pox Plus (15BL Tank White) applied at 6.0 to 8.0 dry mils. Thin only as instructed in manufacturers data sheets.
4. 3rd Coat: Tnemec Series 141 Epoxoline (1255 Beige) applied at 15.0 to 18.0 dry mils. Thin only as instructed in manufacturers data sheets.
5. Total dry film thickness shall be a minimum of 16.5 mils and maximum 23.5 mils.
6. Series 44-710 Accelerator must be used with Series 94 if the surface temperature is 35°F to 60°F and 20% to 40% relative humidity.

C. Coating System – Dry Areas

1. 1st Coat: Tnemec Series 94-H2O Hydro-Zinc applied at 2.5 to 3.5 dry mils. Thin only with approved thinner, Tnemec 41-3 or 41-49 Thinner.
2. Stripe Coat: Tnemec Series N140F Pota-Pox Plus (1255 Beige) applied by brush and scrubbed into all weld seams. In addition to weld seams, all edges, corners, bolts, pits shall receive a stripe coat. This shall be a separate step. The 2nd coat or subsequent coat shall not be applied until the recoat time has been achieved. Thin only as instructed in manufacturers data sheets.
3. Finish Coat: Tnemec Series N140F Pota-Pox Plus (15BL Tank White) applied at 6.0 to 8.0 dry mils. Thin only as instructed in manufacturers data sheets.
4. Total dry film thickness shall be a minimum of 8.5 mils.
5. Series 44-710 Accelerator must be used with Series 94 if the surface temperature is 35°F to 60°F and 20% to 40% relative humidity.

2.6 EXTERIOR FIELD - APPLIED COATING SYSTEMS

A. Tank Exterior Coating System

1. Weld Preparation: Weld flux and spatter shall be removed by power tool cleaning. Sharp projections shall be ground to a smooth contour. All welds shall be ground to a smooth contour as per NACE Standard SP0178, Designation D.
2. Surface Preparation: Surface Preparation: SSPC-SP6 Commercial Blast
3. Cleaning on all bare metal areas (such as weld seams, etc.) and all shop-primed areas damaged during transportation and erection. Anchor profile shall be 1.5 to 2.5 mils as per ASTM D 4417, Method C or NACE Standard RP0287. All (100%) of shop-primed areas shall be uniformly and thoroughly sweep-blasted as per SSPC-SP7 Brush-Off Blast Cleaning prior to applying coating system. Any bare metal exposed during sweep-blasting shall be prepared as per SSPC-SP6 Commercial Blast Cleaning and above.
4. Coating System:
 - a. 1st Coat: Tnemec Series 94-H2O Hydro-Zinc applied at 2.5 to 3.5 dry mils. Thin only with approved thinner, Tnemec 41-2 or 41-3 Thinner.
 - b. 2nd Coat: Tnemec Series 73 Endura-Shield (Color) applied at 2.5 to 3.0 dry mils. (Two coats may be required if applied by roller.) Thin only as instructed in manufacturers data sheets.

- c. Finish Coat: Tnemec Series 700 Hydroflon (Color) applied at 2.5 to 3.0 dry mils. Thin only as instructed in manufacturers data sheets.
- d. Logo Coat: Tnemec Series 700 HydroFlon applied at 2.0 to 3.0 dry mils. Thin only with approved, Tnemec 41-63 Thinner for spray, brush or roller. Colors TBD.
- e. Total dry film thickness shall be a minimum of 7.5 mils.
- f. Series 44-710 Accelerator must be used with Series 94 if the surface temperature is 35°F to 60°F and 20% to 40% relative humidity.

2.7 LETTERING AND LOGO

- A. Lettering and logo design, size, color, and location shall be as directed by Owner. Refer to plans for preliminary model. For approximate orientation of the letters, the west side of tank will read “CLEAR CREEK COMMERCIAL” running vertically up tank with “CLEAR CREEK” as one line and “COMMERCIAL” as one line under that. For the east side of tank, the logo will be the official “K” logo of the City of Killeen. Approximate sizing of letters should be 4-foot tall letters with 1.5-foot spacing. Contractor will submit paint color to Owner for review and approval. The Contractor shall submit scaled, dimensioned drawings for review by Owner. Owner will provide final approval for logo before work begins.
- B. Tank Exterior Color – Tnemec 22YW Barbados
- C. Logo Colors
 - 1. Blue
 - a. Formula: B65L01580
 - b. Description: Fluorokem HS 100 Gloss Safety Blue
 - 2. Red
 - a. Formula: B65R01580
 - b. Description: Fluorokem HS 100 Gloss Safety Red
- D. Lettering Colors
 - 1. Blue
 - a. Formula: B65L01580
 - b. Description: Fluorokem HS 100 Gloss Safety Blue
- E. Accessory Colors
 - 1. Black
 - a. Formula: B65B01580
 - b. Description: Fluorokem HS 100 Gloss Black
 - 2. Terra Cotta
 - a. Formula: B65R01581
 - b. Description: Fluorokem HS 100 Gloss Terra Cotta

PART 3 - EXECUTION

3.1 GENERAL

- A. All surface preparation, coating and painting shall conform to applicable standards of the Society for Protective Coatings, NACE International and the manufacturer's printed instructions. Materials applied to the surface prior to the approval of the Engineer shall be removed and re-applied to the satisfaction of the Engineer at the expense of the contractor.
- B. All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice. Continuity of personnel shall be

coordinated with the Engineer.

- C. The Contractor shall provide a supervisor at the work site during cleaning and application operations. The supervisor shall have the authority to sign change orders, coordinate work and make decisions pertaining to the fulfillment of the contract.
- D. Dust, dirt, oil, grease or any foreign matter that will affect the adhesion or durability of the coating or paint must be removed by washing with clean rags dipped in an approved cleaning solvent and wiped dry with clean rags.
- E. Coating and painting systems include surface preparation, prime coating and finish coatings. Unless otherwise approved in writing by the Engineer, prime coating shall be field applied. Where prime coatings are shop applied, the Contractor shall instruct suppliers to provide the prime coat compatible with the specified finish coat. Any off-site work which does not conform to this specification, is subjected to damage during transportation, construction or installation shall be thoroughly cleaned and touched-up in the field as directed by the Engineer. The Contractor shall use repair procedures which insure the complete protection of all adjacent primer. The specified repair method and equipment may include wire-brushing, hand or power tool cleaning, or dry air blast cleaning. In order to prevent injury to surrounding painted surfaces, blast cleaning may require use of lower air pressure, smaller nozzle and/or abrasive blast particles, or shorter blast nozzle distances from surface shielding and masking. If damage is too extensive or uneconomical to touch-up, the entire item shall be blasted and then coated or painted as directed by the Engineer.

- F. The Contractor's coating and painting equipment shall be designed for application of materials specified and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Contractor's equipment shall be subject to approval of the Engineer.
- G. Application of the first coat shall follow immediately after surface preparation and cleaning and stripe coat, if applicable, before rust bloom occurs or the same day, whichever is less. Any cleaned areas not receiving first coat within this period shall be re-cleaned prior to application of first coat. Use of dehumidification equipment shall be first reviewed by the Engineer and coatings manufacturer prior to deviating from this provision.
- H. Prior to assembly, all surfaces made inaccessible after assembly shall be prepared as specified herein and shall receive the coating or paint system specified.

3.2 SURFACE PREPARATION

- A. The latest revision of the following surface preparation specifications of the Society for Protective Coatings (SSPC) shall form a part of this specification. The summaries listed below are for informational purposes; consult the actual SSPC specification for full detail.
 - 1. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, soil and other contaminants by use of solvents, emulsions, cleaning compounds, steam cleaning or similar materials and methods which involve a solvent or cleaning action.
 - 2. Hand Tool Cleaning (SSPC-SP2): Removal of loose rust, loose mil scale and other detrimental foreign matter to a degree specified by hand chipping, scraping, sanding and wire-brushing
 - 3. Power Tool Cleaning (SSPC-SP3): Removal of loose rust, loose mil scale and other detrimental foreign matter by power wire-brushing, power impact tools or power sanders.
 - 4. White Metal Blast Cleaning (SSPC-SP5/NACE No. 1): Air blast cleaning to a gray-white uniform metallic color until each element of surface area is free of all visible residues.
 - 5. Commercial Blast Cleaning (SSPC-SP6 NACE No. 3): Air blast cleaning until at least two-thirds of each element of surface area is free of all visible residues.
 - 6. Brush-Off Blast Cleaning (SSPC-SP7 NACE No. 4): Air blast cleaning to remove loose rust, loose mil scale and other detrimental foreign matter to a degree specified.
 - 7. Near-White Metal Blast Cleaning (SSPC-SP10 NACE No. 2): Air blast cleaning until at least 95% of each element of surface area is free of all visible residues.
 - 8. Power Tool Cleaning to Bare Metal (SSPC-SP11): Differs from SSPC-SP3 in that it requires more thorough cleaning and a surface profile not less than 1 mil.
 - 9. Waterjet Cleaning of Metals (SSPC-WJ-4/NACE WJ-4): Waterjet (pressure washing) of coated and uncoated metal surfaces.
- B. Slag, weld metal accumulation and spatters not removed by the Fabricator, Erector or Installer shall be removed by chipping and/or grinding. All sharp edges shall be peened, ground or otherwise blunted as required by the Engineer. All grinding and finishing of welds, edges, etc. shall be performed prior to solvent cleaning and abrasive blasting. Welds shall be prepared as per NACE Standard SP0178 for all interior and exterior surfaces:
 - 1. Butt Welds: Shall be ground smooth and free of all defects, designation "D".
 - 2. Lap Welds: Shall be ground smooth and blended., designation "D".
 - 3. Fillet Welded Tee Joint: Shall be ground smooth and blended, designation "D".

The above paragraph contains weld treatment requirements, which should also be called out in any tank fabrication and/or structural specifications. See also 1.05, B of this specification.

- C. Field blast cleaning for all surfaces shall be by dry method unless otherwise directed. Blast nozzles shall be venturi-type nozzles with a minimum pressure at the nozzle of 90 psi.
- D. Particle size of abrasives used in blast cleaning shall be that which will produce the specified surface profile or in accordance with recommendations of the manufacturer of the specified coating or paint system to be applied.
 - 1. If the profile of the blasted steel exceeds the profile specified above, the Contractor shall be required to re-blast the surface using a finer aggregate in order to produce the required profile.
- E. Abrasive used in blast cleaning operations shall be new, washed, graded and free of contaminants that would interfere with adhesion of coating or paint and shall not be reused unless specifically approved in writing by the Engineer. The blast media for field blast cleaning shall be ultra-low dusting, silica-free (<3%) DuPont Starblast XL or GMA Garnet to achieve the required anchor profile and ensure there is no nuisance to surrounding property.
- F. During blast cleaning operations, caution shall be exercised to insure that existing coatings or paint are not exposed to abrasion from blast cleaning.
- G. The Contractor shall keep the area of his work and the surrounding environment in a clean condition. He shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to the accomplishment of the work, the operation of the existing facilities or to the surrounding environment.
- H. Blast cleaned surfaces shall be cleaned prior to application of specified coatings or paint. All surfaces shall be free of dust, dirt, and other residue resulting from the abrasive blasting operation. No coatings or paint shall be applied over damp or moist surfaces.
- I. All welds not scheduled to be abrasive blasted or finished by grinding or sanding with power tools as per SSPC-SP3 or SP11 shall be neutralized with a suitable chemical compatible with the specified coating or paint.
- J. Pitted areas on the tank interior shall be repaired by either filling with Tnemec Series 215 Surfacing Epoxy or Tnemec Series FC22 Epoxoline (floor) or by welding. Epoxy filler shall be feathered smooth. Filler shall be applied between the prime coat and the succeeding coat. No protrusions or spatter will be allowed. Pits deeper than 1/8" shall be filled by welding.
- K. Specific Surface Preparation: Surface preparation for the specific system shall be as noted in Sections 2.4, 2.5 and 2.6.

3.3 NON-VISIBLE CONTAMINANTS

- A. Surface shall be checked in three locations for the presence of chlorides, free iron and sulfates. New tanks shall be tested prior to abrasive blasting; tanks being rehabilitated shall be tested prior to blasting. If blisters are present in existing tank, testing shall also be performed after abrasive blasting. These tests are an Iron Test (Fe^{2+}), Chloride Test and Sulfate Test. Testing shall be carried out as per SSPC Technology Guide 15 "Field Methods for Retrieval and Analysis of

Soluble Salts on Steel and Other Nonporous Substrates". The maximum limits for these contaminants shall be:

1. The maximum level of chlorides is 30 milligrams per square meter or 3 micrograms per square centimeter.
 2. The maximum level of sulfates is 100 milligrams per square meter or 10 micrograms per square centimeter.
 3. The maximum level of ferrous ions (Fe^{2+}) is 50 milligrams per square meter or 5 micrograms per square centimeter.
 4. Contamination levels above these limits will require washing and retesting as specified below until the surface is under the allowable limits.
- B. If testing shows amounts present in the test solution to be greater than the limits listed herein, the Contractor shall clean the surface of the entire tank interior with a 5,000-psi water blast with fine entrained abrasive until the levels in the test solutions are below the maximum acceptable level. Alternate cleaning methods may be allowed with prior approval of the Engineer. Surface shall be reblasted as specified in 2.04 at no additional cost to the Owner.
- C. Contractor shall provide a written statement from paint manufacturer stating that the maximum acceptable levels are not less than those listed herein. Results of the testing shall be provided to the Owner before any coatings are applied.
- D. The following test kits are approved for use on this project:
1. Chlor*Rid Chlor*Test Kit
 2. KTA SCAT Test Kit
 3. Test kits from other vendors shall be submitted to the Engineer for prior approval before use.

3.4 APPLICATION, GENERAL

- A. Coating and paint application shall conform to the requirements of the Society for Protective Coatings Paint Application Specification SSPC-PA1, latest revision, for "Shop, Field and Maintenance Painting".
- B. Thinning shall be permitted only as recommended by the manufacturer and approved by the Engineer, and utilizing the thinners stated in Sections 2.04, 2.05 and 2.06.
- C. Each application of coating or paint shall be applied evenly, free of brush marks, sags, runs, with no evidence of poor workmanship. Care shall be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.
- D. Protective coverings or drop cloths shall be used to protect floors, fixtures and equipment. Care shall be exercised to prevent coatings or paints from being spattered onto surfaces which are not to be coated or painted. Report to the Engineer surfaces from which materials cannot be satisfactorily removed.
- E. When two coats of coating or paint are specified, where possible, the first coat shall contain sufficient approved color additive to act as an indicator of coverage or the two coats must be of contrasting color.

- F. Film thickness per coat as specified in Sections 2.04, 2.05 and 2.06 are the minimum required. If roller application is deemed necessary, the Contractor shall apply additional coats as to achieve the specified thickness.
- G. Apply stripe coat in accordance with manufacturer's recommendations and in accordance with SSPC-PA 11.
- H. All material shall be as specified.

3.5 COATING SYSTEMS APPLICATION

- A. After completion of surface preparation as specified for the specific system, materials shall be applied as noted in Sections 2.04, 2.05 and 2.06.
- B. Care shall be taken so as to eliminate overspray and dry spray on the tank interior. Where such conditions are encountered, the surface shall be cleaned of all over spray and dry spray prior to the application of the succeeding coat.
- C. Areas rendered inaccessible after tank erection such as the spaces between roof plates and rafters shall receive the full coating system prior to erection and/or assembly.

3.6 REPAIRS

- A. After the interior coating system has been installed and holiday tested, repair pinholes and voids as follows:
 - 1. Abrasive blasting shall be in accordance with SSPC-SP10/NACE No.2 Near White Blast Cleaning obtaining a minimal surface profile as specified herein.
 - 2. Power tool cleaning shall be in accordance with SSPC-SP11 Power Tool Cleaning to Bare Metal. Surface profile shall be angular and not less than the surface profile as specified herein.
 - 3. All edges of remaining sound, tightly adhering coating shall be feathered back (beveled) to create a smooth transition from the substrate to the coatings surface. The coating may be considered tightly adhering if an edge cannot be lifted with a dull putty knife.
 - 4. Install the coating system as specified herein to provide a complete and monolithic system, free of voids and pinholes. Alternatively, Tnemec Series FC22 Epoxoline may be used as a repair material when approved by the Engineer or his representative in consideration of the area(s) to be repaired.
- B. For exterior surfaces, repair as follows:
 - 1. Hand or Power Tool Sand as per SSPC-SP2 or SP3 to remove the defect. In cases where the defect extends to the substrate, prepare the surface as per SSPC-SP11 Power Tool Cleaning to Bare Metal, obtaining a minimum anchor profile as specified herein.
 - 2. All edges of remaining sound, tightly adhering coating shall be feathered back (beveled) to create a smooth transition from the substrate to the coatings surface. The coating may be considered tightly adhering if an edge cannot be lifted with a dull putty knife.
 - 3. Install the coating system as specified herein to provide a complete and monolithic system, free of voids and pinholes.

3.7 SOLVENT VAPOR REMOVAL

- A. All solvent vapors shall be completely removed by suction-type exhaust fans and blowers before placing tank in operating service.
- B. All solvent vapors will be exhausted both during and after coating application as per AWWA D 102 to allow the proper curing of the coating material.
- C. Ventilation shall be continued until such time as the coating has reached “full cure” as specified by the coating manufacturer.

3.8 DISINFECTION

- A. Disinfection of interior surfaces shall be performed in the presence of the Engineer in accordance with all the requirements of ANSI/AWWA C652 and regulatory agencies. Contractor shall submit his preferred method of disinfection to the Engineer for approval prior to disinfection.
- B. Disinfection shall be performed after protective coatings have been applied to the interior surfaces and allowed to thoroughly cure.
- C. Prior to disinfecting, the complete interior shall be washed down with clean water and thoroughly flushed out.

3.9 CLEAN UP

- A. Upon completion of the work, all staging, scaffolding and containers shall be removed from the site or destroyed in a manner approved by the Engineer. Coating or paint spots or oil stains upon adjacent surfaces shall be removed and the jobsite cleaned. All damage to surfaces resulting from the work of this section shall be cleaned, repaired or refinished to the satisfaction of the Engineer at no cost to the Owner.

3.10 GUARANTEE

- A. The tank Contractor shall guarantee its work for a period of one year from the date of completion of its work to the extent that it will repair any defects which may appear because of faulty design, workmanship or material furnished under the specifications.

END OF SECTION

SECTION 31 23 00 – TRENCHING, EXCAVATION AND BACKFILLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and other Division-1 Specification Sections, apply to this Section.
- B. Section 31 05 16 - Aggregates

1.2 REQUIREMENTS

- A. This Section pertains to excavating and backfilling of underground utilities.
- B. The Contractor shall excavate, protect and backfill all trenches that may be necessary for completing the work to be done under this contract. All excavations shall be in open trenches, except where and to such extent as the Owner may authorize or require that the same be done by tunneling, boring or jacking. Trenches may be in general excavated or backfilled either by machinery or by hand as the Contractor may elect; provided, however, that the Owner shall be empowered, wherever he shall decide that such necessity exists, to require that hand excavation be employed and that backfilling by hand shall be done to the extent required. The Contractor shall have no claim for extra compensation due to the fact that hand excavation may be required by the Owner.
- C. The Contractor shall perform all excavation of every description and of whatever substance encountered, to the depths indicated on the drawings, as specified herein, or as required by the Owner. All excavated material not required for backfill shall be removed and wasted or otherwise disposed of as required or specified.

1.3 EXCAVATION CLASSIFICATION

- A. Excavation shall be classified as follows:
- B. Earth Trench Excavation - The removal to required elevations of all clay, silt, loam, sand, gravel hardpan, pavements of all kinds, loose stone and all boulders measuring less than one (1) cubic yard in volume.
- C. Rock Trench Excavation - The removal of rock, ledge rock, mass concrete structures and boulders measuring more than one (1) cubic yard in volume.

1.4 EXCAVATION LIMITS

- A. The Contractor shall provide temporary sheeting, bracing, shoring or trenches as necessary to protect adjacent structures and provide safe working conditions.

- B. Rock and boulders shall be removed to provide a clearance of six inches (6") below and one foot (1') on each side of all pipe.
- C. Limits of trench excavation shall be as shown on the applicable trench details given on the contract drawings. Unstable soils on the trench bottom shall be removed and replaced with specified material as directed by the Engineer.

1.5 REMOVAL AND STORAGE OF MATERIALS

- A. In case more material is excavated from any trench than can be backfilled over the completed pipe or can be stored within the limits of the right-of-way, leaving space for the traffic and drainage as herein provided, the excess material shall be removed to some convenient place, provided by the Contractor. The Contractor shall, at his own cost and expense, bring back as much of the material so removed as may be required to properly backfill the trench, if of the proper kind; or, if so required, the Contractor, shall, at his own cost and expense, furnish such other suitable materials as may be necessary.
- B. When it is necessary to haul soft or wet materials over the roads, the Contractor shall provide suitable tight vehicles to prevent spillage.
- C. All topsoil shall be removed from the limits of trenches before the commencement of trench excavation. After the trenches are backfilled, the topsoil shall be replaced. No additional compensation will be made to the Contractor for this removal and replacement of topsoil. No topsoil shall be removed from the site.

PART 2 - PRODUCTS

2.1 FILL AND BACKFILL MATERIAL

- A. Materials required for backfilling shall be as shown on the Drawings and as herein specified or as ordered by the Engineer.
- B. The Engineer reserves the right to inspect proposed sources of off-site material and to order such tests of the material which he deems necessary to ascertain its quality and gradation of particle size. The Contractor shall, at his expense, engage an approved testing laboratory to perform such tests, the results of which shall be furnished to the Engineer. If similar tests of the material from a particular source were performed previously, the Contractor may submit results of these tests to the Engineer for consideration.
- C. No backfill material shall be used on this project until approval is obtained from the Engineer and only material from approved sources shall be used. Backfill materials are designated by the following types and uses:
 - 1. On-Site Material
 - a. If the excavated material on site is suitable to the Engineer for backfilling purposes, it shall be used and the surplus properly disposed of.
 - b. On-site material shall be on-site excavated material which is free of all frozen material, boulders, trash, cinders, ashes, asphalt, stones no larger than 2-inches in the largest dimension, and foreign debris. Unless otherwise shown on the Contract

Drawings or as ordered by the Engineer, approved on-site material shall be used for all backfilling outside of pavement areas.

2. Select Backfill or Borrow This material shall consist of borrow material. It shall be free of stones or rocks over 8 inches and shall have a plasticity index of less than 20. The moisture content at the time of compaction shall be within 2 percent of optimum as determined by TxDOT Test Method Tex-114
3. Controlled Low Strength Concrete / Flowable Fill
Shall be ready-mix, flowable backfill which develops 28-day compressive strength between 50-150 psi. CDF shall be excavatable after setting, self-compacting and self-leveling. CDF shall include following ingredients; portland cement ASTM C-150, fly ash type-F ASTM C-618, air entraining admixture ASTM C-260 (maximum 30%), sand aggregate ASTM C-33 and water.

PART 3 - EXECUTION

3.1 PIPE BACKFILL REQUIREMENTS

- A. Trenches shall be backfilled immediately after installing the pipe. The pipe laying operation may be held up by the Engineer if the backfill operation does not follow immediately.
- B. Bedding and Backfill Around Pipe
 1. All pipe embedment shall be as shown on the Plans and consist of fine aggregate Type A6 (sand) as specified in Section 31 05 16.
 2. When conditions warrant, crushed stone shall be used within rock and within unstable trench bottom conditions.
 3. Bedding material shall be deposited up to the springline of the pipe, completely encasing the lower half of the pipe. The material shall then be thoroughly hand compacted to the specified density (see Section 31 23 01) out to the side of the trench wall.
 4. The bedding envelope shall then be completed to the dimensions as shown in the details.
- C. Trench Backfill and Maintenance
 1. From top of the bedding of the pipe, the trench shall be backfilled as shown in the Drawing Details with the materials described above in this Section.
 2. Backfill material shall be deposited in twelve inch (12") lifts and thoroughly compacted to the densities as specified in Section 31 23 01.
 3. It is important that the trench be relatively dry during the backfill operation and that the trench be backfilled immediately after installation and backfill around the pipe is completed. The method of consolidation shall be dependent upon the type of backfill material and the finished ground surface above the trench.

D. Special Backfill Requirements

1. Where existing utilities are exposed during construction, the Engineer may require that a timber or steel beam be installed under the exposed line with both ends set on undisturbed ground and intermediate supports and blocking set as directed.

3.2 WASTE MATERIAL DISPOSAL

- A. Excess excavated material, debris, waste construction materials shall be properly disposed of. The Contractor shall haul the material to an approved site and pay for any disposal costs.

3.3 SITE GRADING

- A. Unless otherwise indicated on the plans, the construction site shall be returned to its original elevations.
- B. Lawn areas disturbed shall be backfilled to within the specified distance of the original grade and filled the remainder of the way with topsoil, previously stockpiled from the area or imported from an approved source.
- C. Road, driveways, and parking areas shall be backfilled to the original grade with the specified material. The Contractor shall maintain this surface, filling all settlements as they occur. No extra payment will be made for this work.

END OF SECTION 31 23 00

SECTION 31 23 01 – SOIL COMPACTION CONTROL

PART 1 - GENERAL

1.1 GENERAL

- A. Compaction densities specified herein apply to pipe installed within an excavated open trench and shall be the percentage of the maximum density obtainable at optimum moisture content as determined and controlled in accordance with ASTM D3017. Testing for density shall be in accordance with Test Method Tex-114-E and Test Method Tex-115-E.
- B. Each layer of backfill shall be moistened or dried as required, and shall be compacted in the following densities, unless otherwise specified in the project specifications:
 - 1. Bedding to springline of pipe (all areas) - 95%
 - 2. From springline of pipe to original grade
 - a. Under traffic areas (roads, driveways, parking lots, etc.) - 95%
 - b. Under non-traffic areas - 90%

1.2 METHODS AND EQUIPMENT

- A. Methods and equipment proposed for compaction shall be subject to the prior approval of the Engineer. In compacting by rolling or operating heavy equipment over the pipe lines, displacement of, or injury to the pipe and structures shall be avoided. Movement of in-place pipe or structures shall be at the Contractor's risk. Any pipe or structure damaged thereby shall be replaced or repaired as directed by the Engineer and at the expense of the Contractor.

1.3 TESTING

- A. In traffic areas, field density tests may be ordered by the Engineer for each foot of depth of backfill at an average interval of 200 feet along the trench except as further specified. In non-traffic areas, field density tests may be ordered by the Engineer for each foot of depth of backfill at an average interval of 1,000 feet along the trench except as further specified
- B. The Contractor shall furnish all necessary samples for laboratory tests and shall provide assistance and cooperation during field tests. The Contractor shall plan his operations to allow adequate time for laboratory tests and to permit taking of field density tests during compaction.
- C. If compaction tests do not meet specifications herein, the Contractor shall be ordered to change his methods of operation and/or his backfill materials, at no cost to the Owner. Additional testing requirements shall be the responsibility of the Contractor.
- D. Inadequate compaction shall be cause for the Owner to issue a stop work order to the Contractor.

END OF SECTION 31 23 01

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SECTION 31 23 23 – CONTROLLED LOW STRENGTH MATERIAL

PART 1 - GENERAL

1.01 GENERAL

- A. Controlled Low Strength Material (CLSM) is used as a bedding material for Vitrified Clay Pipe to meet the requirements of ASTM C12 Practice for Installing Vitrified Clay Pipe, Section 6, Bedding and Encasement, and the National Clay Pipe Engineering Manual (2006), Chapter 4, Part II, Structural Design.
- B. The CLSM mix design shall consist of Portland cement, fine aggregate, water and chemical admixtures to accelerate cure time and entrained air.
- C. The actual mix design shall be determined by the producer of the CLSM within these guidelines and be approved by the engineer.
- D. These guidelines are for CLSM when it is desirable for a mix to cure rapidly to facilitate initial backfill at the earliest possible time.

1.02 CLSM MIX DESIGN & EXAMPLE MIX (PER 27 CU. FT. OF MIX) CLSM MIX DESIGN

Cement:	188 pounds (Type II/V)
Fine Aggregate:	74% - 80% (by weight)
Coarse Aggregate (3/8"):	20% - 25% (by weight)
Water:	water necessary to obtain slump (see slump)
Accelerator:	4% (as a percent of cement)
Air Entrainment:	15% - 20%
Slump:	8 inch +/- 1 inch spread diameter (3 inch diameter by 6 inch long cylinder, ASTM D 6103)
L. Compressive Strength:	28 days, 100 – 300 psi

CLSM Example Mix

A. Cement:	188 pounds (Type II/V)
B. Fine Aggregate:	2028 pounds (Specific Gravity 2.58)
C. Coarse Aggregate (3/8"):	507 pounds (Specific Gravity 2.61)
D. Water:	375 pounds (total water)
E. Accelerator:	4% (as a percent of cement)
F. Air Entrainment:	18% total air including entrapped air
G. Slump:	8 inch +/- 1 inch spread diameter (3 inch diameter by 6 inch long cylinder, ASTM D 6103)
H. Compressive Strength:	28 days, 100 – 300 psi

1.02 REFERENCE

STANDARDS Referenced ASTM:

ASTM C 12	Standard Practice for Installing Vitrified Clay Pipe Lines
ASTM C 33	Standard Specification for Concrete Aggregates
ASTM C 39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C 138	Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
ASTM C 143	Standard Test Method for Slump of Hydraulic Cement Concrete
ASTM C 150	Standard Specifications for Portland Cement
ASTM C 226	Standard Specifications for Air-Entrained Additions for use in the Manufacture of Air Entrained Hydraulic Cement
ASTM C 403	Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
ASTM C 494	Standard Specifications for Chemical Admixtures
ASTM C 618	Standard Specifications for Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C 684	Standard Test Method for Making, Accelerated Curing, and Testing Concrete Compression Test Specimen
ASTM C 684	Standard Test Method for Flow Consistency of Controlled Low Strength Material (CLSM)

PART 2 - PRODUCT

2.01 PORTLAND CEMENT

- A. Portland cement shall meet the requirements of ASTM C 150, Type II, V or a combination thereof, including Section 03300, Part 2.01 A of the EMWD Specifications.

2.02 FINE AGGREGATES

- A. Aggregates shall conform to ASTM C 33 and Section 03300, Part 2.01 B of the EMWD Specifications, except as follows: Aggregates shall be pretested in CLSM mixtures similar to those anticipated for the work, confirming their ability to perform as required for the specific application. Fine aggregates will be 75% - 80% of total aggregate by weight.

2.03 COARSE AGGREGATES

- A. Aggregates shall conform to ASTM C 33 and Section 03300, Part 2.01 B of the EMWD Specifications, be 3/8" in size, except as follows: Aggregates shall be pretested in CLSM mixtures similar to those anticipated for the work, confirming their ability to perform as required for the specific application. Coarse aggregates will be 20% - 25% of total aggregate by weight.

2.04 WATER

- A. Water shall be free of oils, acids, alkalies, organic matter or other deleterious substances. The amount

added shall be adjusted for moisture content of the aggregates.

2.05 ACCELERATOR

- A. Chemical admixtures for the use in accelerating the CLSM cure time shall be 4% of the cement content. CaCI shall not be used because of its corrosive nature and the availability of admixtures specifically designed for the purpose. Accelerating admixtures shall meet the requirements of ASTM C 494.

2.06 AIR ENTRAINMENT

- A. Chemical admixtures shall be specifically designed for air entrainment and meet the requirements of ASTM C 226.
- B. The mix shall have 15% - 20% air entrainment including entrapped air.

2.07 FLY ASH

- A. Fly ash is not necessary for this mix design. The mix contains entrained air and a slump that provides adequate flowability.
- B. The addition of fly ash will retard the cure rate and will change the ultimate compressive strength.

2.08 SLUMP

- A. Slump shall have 8 inch +/- 1 inch spread diameter using a three (3) inch diameter by six (6) inch long cylinder and shall meet the requirements of ASTM D 6103.

2.09 COMPRESSIVE STRENGTH

- A. The 28 day compressive strength of the CLSM shall be 100 psi to 300 psi per ASTM C 39.

2.10 PENETROMETER

- A. A penetrometer shall be used to determine the set time for the placed CLSM and meet the requirements of ASTM C 403.
- B. The penetrometer must have a maximum load reading of 700 psi and have a one (1) square inch by one (1) inch long cylinder foot attachment to a ¼ inch diameter pin. ASTM C 403 for configuration. The penetrometer shall be inserted into the CLSM to a depth of one (1) inch and the reading recorded.
- C. The load readings on the penetrometer are not the compressive strength of the CLSM as measured by the standard concrete cylinder test.

PART 3 - EXECUTION

3.01 MIXING

- A. The supplier shall determine the unit weights based upon the specific gravity of the fine and coarse

aggregate. The ratio shall be 75% - 80% fine aggregate to 20% - 25% coarse aggregate by weight. Mixing shall conform to the requirements of Section 03300, Part 2.03 of the EMWD Specifications, except for the one and one-half hour time limit specified in Paragraph B of Part 2.03. The minimum mix time required shall be specified by the supplier. Unless otherwise specified, under conditions contributing to quick setting, the Engineer may specify a time limit, not to exceed two and one-half hours.

- B. Adjustment of the mixture to achieve improved placement characteristics shall be through the use of chemical admixtures. No increase in water content or water to cement ratio will be allowed.
- C. Admixtures shall be added per the suppliers' recommendations.
- D. Water shall be added as specified and yield a slump as above.

3.02 TESTING

- A. CLSM shall be tested for plastic unit weight. Plastic unit weight shall not deviate more than +/-10 percent of theoretical unit weight shown on the approved mix design. Unit weight shall be determined in accordance with ASTM C138.
- B. CLSM's consistency shall be tested by the slump method. The slump shall be measured in accordance with ASTM C143.
- C. Penetrometer readings shall be made.

3.03 PLACEMENT

- A. Refer to ASTM C 12 for bedding details.
- B. CLSM must be thoroughly mixed in the delivery truck immediately before discharge and carefully placed by tremme, chute, conveyer, bucket or pump and placed on top of the pipe and alternating equally on both sides of the pipe in a manner so as not to move the pipe from the installed position. CLSM should not be free fall placed from a height greater than seven (7) feet or impact against the trench walls. To contain CLSM when filling long open trenches, the end points shall be adequately bulkheaded to prevent movement. Methods may include bulkheading with sandbags, earth dams, forms or stiffer mixtures of CLSM.
- C. CLSM may be placed in one lift.
- D. CLSM must be placed continuously to the trench sidewalls.
- E. Vibratory equipment must not be used.

3.04 BACKFILL

- A. Initial backfill shall only commence after the following requirements are met:
- B. Penetrometer (as defined herein) readings shall be taken in the CLSM alongside the pipe.

- C. If it is not practical to use the penetrometer in the trench, CLSM may be collected in a cardboard box of approximately 12" wide by 12" wide by 9" tall for each 30 minute interval of pour and penetrometer measurements made from this accessible location.
- D. A 500 psi minimum penetrometer reading is required.

END OF SECTION 31 23 23

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SECTION 31 50 00 - TRENCH EXCAVATION PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Trench protection for all trenches over five (5') feet in depth shall be accomplished by the CONTRACTOR in accordance with all provisions of PART 1926, SUBPART P - EXCAVATIONS, TRENCHING, AND SHORING AND INTERPRETATIONS (OSHA), or any updated and subsequent version thereof.
- B. It is the sole duty, responsibility, and prerogative of the CONTRACTOR, not the OWNER or ENGINEER, to determine the specific applicability of a trench safety system to each field condition encountered on the project. It will be the CONTRACTOR'S responsibility to identify the soil type and to accurately adjust his trench safety methods according to the OSHA requirements.
- C. The CONTRACTOR shall indemnify and hold harmless the OWNER, its employees and agents, from any and all damages, costs, (including, without limitation, legal fees, court costs, and the cost of investigation), judgments or claims by anyone for injury or death of persons resulting from the collapse or failure of trenches constructed under this Contract.
- D. The CONTRACTOR acknowledges and agrees that this indemnity provision provides indemnity for the OWNER in case the OWNER is negligent either by act or omission in providing for trench safety, including, but not limited to, inspections, failure to issue stop work orders, and the hiring of the Contract.
- E. The bid item for "osha trench safety" shall include payment for the any planning as well as the actual trench wall support.
- F. Damages to adjacent existing utilities and improvements of any kind that occur when the trench walls move, shall be repaired at the contractor's expense.

END OF SECTION 31 50 00

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SECTION 32 31 13 - GALVANIZED CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Drawings and general provisions of the contract, including General and Special conditions and DIVISION 1 - GENERAL REQUIREMENTS sections, apply to this section.

1.2 SUBMITTALS

- A. Shop drawings: Layout of fences and gates with dimensions, details, and finishes of components, accessories, and post foundations.
- B. Product data: Manufacturer's catalog cuts indicating material compliance and specified options.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Products from qualified manufacturers having a minimum of five (5) years experience manufacturing galvanized coated chain link fencing will be acceptable by the Engineer.
- B. Obtain chain link fences and gates, including accessories, fittings, and fastenings, from a single source.
- C. Approved Manufacturer: Master- Halco / Anchor Fence, Baltimore, MD Phone (800) 229-5615 Fax (410) 676-7098, or equal.

2.2 CHAIN LINK FENCE FABRIC

- A. Galvanized wire: Zinc coated Wire, ASTM A 392 - Class 1 (1.2oz/sf), Wire Spec-A817-83.
- B. Size: Helically wound and woven to height of 6 ft. with 2 in. diamond mesh, 9 gauge, with a wire diameter of 0.148 in. and a breakload of 1,290 lbs.
- C. Selvage of fabric twisted at top and knuckled at bottom.

2.3 STEEL FENCE FRAMING

- A. Steel pipe - Type I: ASTM F 1083, standard weight schedule 40; minimum yield strength of 25,000 psi; sizes as indicated. Hot-dipped galvanized with minimum average 1.8 oz./ft² of coated surface area.

- B. Formed steel ("C") sections: Roll formed steel shapes complying with ASTM F 1043, Group II, produced from 45,000 psi yield strength steel; sizes as indicated. External coating per ASTM F 1043, Type A, minimum average 2.0 oz./ft² of zinc per ASTM A 123, or 4.0 oz./ft² per ASTM A 525.
- C. Steel square sections: ASTM A 500, Grade B steel having minimum yield strength of 40,000 psi; sizes as indicated. Hot-dipped galvanized with minimum 1.8 oz./ft² of coated surface area.
- D. End and Corner Post: 2-1/2 in. od, 3.65 lbs./ft.
- E. Line (intermediate) Post: 2 in. od, 2.72 lbs./ft.
- F. Rail and Braces: 1-5/8 in. od, 2.27 lbs./ft.

2.4 SWING GATES

- A. Gate frames: Fabricate chain link swing gates in accordance with ASTM F 900 using galvanized steel tubular members, 2 in. square, weighing 2.60 lb./ft. Fusion or stainless steel welded connections forming rigid one-piece unit. For gates over 8 ft. high or 15 ft. wide, provide minimum 1-1/2 in. square additional horizontal and vertical interior members to ensure proper strength.
- B. Chain link fence fabric: Gate fabric to be same as fence fabric.
- C. Hardware materials: Hot dipped galvanized steel or malleable iron shapes to suit gate size.
- D. Hinges: Structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180° inward or outward.
- E. Latch: Forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.
- F. Keeper: Provide keeper for each gate leaf over 5 ft. wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.
- G. Double gates: Provide drop rod to hold inactive leaf. Provide gate stop pipe to engage center drop rod. Provide locking device and padlock eyes as an integral part of latch, requiring one padlock for locking both gate leaves.
- H. Barbed wire top: Incorporate provisions for barbed extensions by extending vertical members 13 in. to accommodate three strands of barbed wire.
- I. Gate posts: Steel pipe ASTM F 1083 standard weight schedule 40; minimum yield strength of 25,000 psi. Hot-dipped galvanized with minimum 1.8 oz./ft² of zinc.

<u>Gate leaf single width</u>	<u>Post Size (Round)</u>	<u>Weight</u>
6 ft. (1829 mm) or less	2.875 in. (73 mm)	5.79 lb./ft. (8.6 kg/m)
6 ft. (1829 mm) to 12 ft. (3657 mm)	4.00 in. (101.6 mm)	9.11 lb./ft. (13.6 kg/m)
12 ft. (3657 mm) to 19 ft. (5790 mm)	6.625 in. (168.3 mm)	18.97 lb./ft. (28.3 kg/m)

19 ft. (5790 mm) to 23 ft. (7010 mm)	8.625 in. (219.1 mm)	28.55 lb./ft. (42.5 kg/m)

- J. Setting Materials: Concrete - Minimum twenty-eight (28) days compressive strength of 3,000 psi.
- K. Chain Link Swing Gate Post Installation
1. Install gate posts in accordance with manufacturer's instructions.
 2. Concrete set gate posts: Drill holes in firm, undisturbed or compacted soil. Holes shall have diameter four (4) times greater than outside dimension of post, and depths approximately 6 in. (152 mm) deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36 in. (914 mm) below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour. Trowel finish around post and slope to direct water away from posts.
 - a. Gate posts and hardware: Set keeper, stops, sleeves into concrete. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.
- L. Gate Installation
1. Install gates plumb, level, and secure for full opening without interference.
 2. Attach hardware by means which will prevent unauthorized removal.
 3. Adjust hardware for smooth operation.
 4. Touch up hardware.

2.5 CLEANING

- A. Clean up debris and unused material, and remove from the site.

2.6 ACCESSORIES

- A. Chain link fence accessories: Provide items required to complete fence system. Galvanize each ferrous metal item and finish to match framing.
- B. Post caps: Formed steel, cast malleable iron, or aluminum alloy weathertight closure cap for tubular posts. Provide one cap for each post. Cap to have provision for barbed wire when necessary. "C" shaped line post without top rail or barbed wire supporting arms do not require post caps. (Where top rail is used, provide tops to permit passage of top rail.)
- C. Top rail and brace rail ends: Pressed steel per ASTM F626, for connection of rail and brace to terminal posts.
- D. Top rail sleeves: 7 in. expansion sleeve with spring, allowing for expansion and contraction of top rail.
- E. Wire ties: 9 gauge (0.148 in.) galvanized steel wire for attachment of fabric to line posts. Double wrap 13 gauge (0.092 in.) for rails and braces. Hog ring ties of 12-1/2 gauge (0.0985 in.) for attachment of fabric to tension wire.
- F. Brace and tension (stretcher bar) bands: Pressed steel. At square post provide tension bar clips.

- G. Tension (stretcher) bars: One piece lengths equal to 2 in. less than full height of fabric with a minimum cross-section of 3/16 in. x 3/4 in. or equivalent fiber glass rod. Provide tension (stretcher) bars where chain link fabric meets terminal posts.
- H. Tension wire: Galvanized coated steel wire, 7 gauge, (0.177 in.) diameter wire with tensile strength of 75,000 psi.
- I. Truss rods & tightener: Steel rods with minimum diameter of 5/16 in. Capable of withstanding a tension of minimum 2,000 lbs.
- J. Nuts and bolts are galvanized.
- K. Tension wire: Galvanized coated steel wire, 7 gauge, (0.177 in.) diameter wire with tensile strength of 75,000 psi.
- L. Barbed wire: ASTM A 121 Class 3, zinc coated steel wire double-strand, 12-1/2 gauge (0.099 in.) twisted line wire with galvanized steel, four (4) point barbs spaced approximately 5 in. on center.
- M. Barbed wire supporting arms: Pressed steel arms with provisions for attaching three (3) rows of barbed wire. Arms shall withstand 250 lbs. downward pull at the outermost end of arm without failure.
 - 1. Provide 450, 3 strands, single arm
 - 2. Provide intermediate arms with hole for passage of top rail.

2.7 SETTING MATERIALS

- A. Concrete: Minimum twenty-eight (28) days compressive strength of 3,000 psi.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify areas to receive fencing are completed to final grades and elevations.
- B. Ensure property lines and legal boundaries of work are clearly established.

3.2 CHAIN LINK FENCE FRAMING INSTALLATION

- A. Install chain link fence in accordance with ASTM F 567 and manufacturer's instructions.
- B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30 degrees or more.
- C. Space line posts uniformly at 10 ft. on center.
- D. Concrete set terminal and gate posts: Drill holes in firm, undisturbed or compacted soil. Holes shall have diameter four (4) times greater than outside dimension of post, and depths

approximately 6 in. deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36 in. below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour. Trowel finish around post. Slope to direct water away from posts.

- E. Drive Anchor (line) posts: With protective cap, drive post 36 in. into ground. Slightly below ground level install drive anchor shoe fitting. Install two (2) diagonal drive anchors and tighten in the shoe.
- F. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.
- G. Bracing: Install horizontal pipe brace at mid-height for fences 6 ft. and over, on each side of terminal posts. Firmly attach with fittings. Install diagonal truss rods at these points. Adjust truss rod, ensuring posts remain plumb.
- H. Tension wire: Provide tension wire at bottom of fabric. Install tension wire before stretching fabric and attach to each post with ties. Secure tension wire to fabric with 12-1/2 gauge (0.0985 in.) hog rings 24 in. oc.

3.3 CHAIN LINK FABRIC INSTALLATION

- A. Fabric: Install fabric on security side and attach so that fabric remains in tension after pulling force is released. Leave approximately 2 in. between finish grade and bottom selvage. Attach fabric with wire ties to line posts at 15 in. on center and to rails, braces, and tension wire at 24 in. on center.
- B. Tension (stretcher) bars: Pull fabric taut; thread tension bar through fabric and attach to terminal posts with bands or clips spaced maximum of 15 in. on center.

3.4 ACCESSORIES

- A. Tie wires: Bend ends of wire to minimize hazard to persons and clothing.
- B. Fasteners: Install nuts on side of fence opposite fabric side for added security.
- C. Barbed wire: Uniformly space parallel rows of barbed wire on security side of fence. Pull wire taut and attach in clips or slots of each extension.

3.5 CLEANING

- A. Clean up debris and unused material, and remove from the site.

END OF SECTION 32 31 13

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SECTION 32 31 50 - ROLLING CHAIN LINK GATE

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish and install one steel-frame industrial rolling gate in accordance with details shown on the Drawings and as specified.

1.2 SUBMITTALS

- A. Submit the following according to the General Conditions of the Contract and DIVISION 1 - GENERAL REQUIREMENTS specifications:
 - 1. Product data, including manufacturer's technical data, specifications and installation instructions.
 - 2. Shop drawings showing locations, dimensions and wiring diagrams.

1.3 QUALITY ASSURANCE

- A. Gate to be installed by manufacturer with at least ten (10) years experience in rolling gate systems.
- B. Manufacturer shall be Viking Fence Co., Austin, Texas, or ENGINEER approved equal.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Industrial rolling Gate Frame: Schedule 40 galvanized-steel gate frame using 2-3/8 in. framework (top and bottom rails, end and center vertical members) with 1-7/8 in. diagonal bracing. Framing members shall be ASTM A53 seamless steel pipe with galvanized coating per ASTM A123.
- B. Fabric: 9 gauge, 2 in. mesh; galvanized ASTM A392, Class II or aluminum coated ASTM A491, Class II; barbed salvage top and bottom.
- C. Concrete: Class D (4,000 psi) per SECTION 03300 - CAST-IN-PLACE CONCRETE for concrete runner strip.
- D. Barbed Wire: Galvanized, ASTM A121, Class 2 or aluminum coated; three 12-1/2 gage steel wires with 4-point barbs; mounted on gate frame per manufacturer's recommendations.
- E. B-track guide for bottom wheel roller shall be galvanized steel angle of size and shape to accommodate roller wheel, mounted on concrete runner strip per manufacturer's recommendations.
- F. Bottom Roller Wheel: 6 in. galvanized steel V-Groove Roller, 800 lbs. capacity, with roller bearings, zirk fitting and axle, designed to move smoothly on V-track guide.
- G. Guide Rollers: 6 in. rubber rollers (with bearings) and rugged weldable steel mounting bracket. End of rollers shall extend 2-7/8 in. ± from mounting bracket.

- H. Gate End Stop: Furnish and install suitable galvanized steel end plate per manufacturer's recommendations to stop gate at full open/closed positions.
- I. Lock and Key Pad: Provide industrial lock with key.

PART 3 - EXECUTION

A. INSTALLATION

- 1. Install gate to comply with details shown on the Drawings, these specifications, and manufacturer's recommendations.
- 2. Gate frame piping shall be notched at joints and connected with full welds all around the connection.

END OF SECTION

SECTION 32 90 00 – REVEGETATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplemental Conditions and Division-1 Specification Sections, apply to this Section.

1.2 ORDER OF WORK

- A. As soon as the installation and testing of the improvements are completed and accepted, the Contractor shall proceed to restore all disturbed areas to their original condition or better. Lawns, fields, shrubs, trees and other disturbed areas shall be restored to a condition as specified herein.
- B. The Contractor shall remove and stockpile topsoil from all excavation areas. Topsoil will be replaced to complete grading and seeding operations. In the event additional topsoil is required, the Contractor shall furnish topsoil to make up for the deficiency, at his own expense. Developed areas shall have a depth of topsoil as shown on the detail sheet, on a graded bed while field and open land areas shall be graded with excavated material. If cultivated or crop fields are disturbed by the Contractor, they shall have a minimum of twelve inches (12") of topsoil added.

1.3 DEFINITIONS

- A. Maintenance Period: Begin maintenance immediately after each area is planted and continue for a period no less than 8 weeks after all planting under this section is completed.
- B. Satisfactory Stand: Grass or section of grass of 10,000 square feet or larger that has:
 - 1. No bare spots larger than 3 square feet.
 - 2. Not more than 10 percent of total area with bare spots larger than 1 square foot.
 - 3. Not more than 15 percent of total area with bare spots larger than 6 square inches.

1.4 SUBMITTALS

- A. Certification of Grass Seed: Submit seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed for each grass seed species.
- B. Fertilizer and Other Soil Amendments: Submit delivery tickets when received on site.

1.5 JOB CONDITIONS

- A. Planting Time: Sow lawn seed only during normal planting seasons for each type of lawn work required. Correlate planting with specified maintenance periods to provide required maintenance from date of substantial completion.

1.6 WEATHER RESTRICTIONS

- A. Perform Work under favorable weather and soil moisture conditions as determined by accepted local practice.

1.7 SEQUENCING AND SCHEDULING

- A. Prepare topsoil as specified before starting seeding, sodding or sprigging.
- B. Complete seeding, sodding or sprigging within 10 days following completion of soil preparation.
- C. Notify ENGINEER at least 3 days in advance of:
 - 1. Each material delivery.
 - 2. Start of planting activity.

1.8 MAINTENANCE SERVICE

- A. CONTRACTOR: Perform maintenance operations during maintenance period to include:
 - 1. Watering: Keep surface moist.
 - 2. Washouts: Repair by filling with topsoil, liming, fertilizing, seeding, and mulching.
 - 3. Mulch: Replace wherever and whenever washed or blown away.
 - 4. Temporary Fences: Repair and maintain until satisfactory stand of grass is established.
 - 5. Reseed unsatisfactory areas or portions thereof immediately at the end of the maintenance period if a satisfactory stand has not been produced.
 - 6. Reseed/replant during next planting season if scheduled end of maintenance period falls after September 15.
 - 7. Reseed/replant entire area if satisfactory stand does not develop by July 1 of the following year.

1.9 SPECIAL PROJECT WARRANTY

- A. Warranty lawns and grasses through specified maintenance period and until final acceptance.

PART 2 - PRODUCTS

2.1 TOPSOIL

- A. Topsoil shall be surface layer of sandy loam soil, free of stones, debris and any material toxic to plant growth and shall be free of subsoil and stumps, roots, brush, stones, clay lumps or similar objects larger than one inch (1") in greatest diameter. The topsoil or soil mixture, unless otherwise approved or specified, shall have an acidity range of approximately 5.5 pH to 7.6 pH, when tested according to the methods of testing of A.O.A.C. in effect on the date of the invitation for bids. The organic content shall be not less than 4% nor more than 20% as determined by the wet combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% passing the 200 mesh sieve as determined by the wash test made in accordance with the standard test ASTM designation D-1140.

- B. Topsoil may be amended by the Contractor with approved materials and methods to meet the above Specifications.

2.2 MULCH

- A. Straw mulch shall consist of stalks of oats, wheat, rye or other approved crops, which are free of noxious weeds. Weight shall be calculated on the basis of the straw having not more than 15% of moisture content.

2.3 FERTILIZER

- A. Commercial fertilizer (5-10-5) shall contain not less than 5% nitrogen, 10% available phosphoric acid and 5% water soluble potash. The fertilizer shall be inorganic or a combination of inorganic and organic substances. The methods used to determine the various elements shall be those adopted by the Association of Official Agricultural Chemists.
- B. If as an alternative, the Contractor wishes to substitute for commercial fertilizer 5-10-5 or 6-12-6, he may do so with the approval of the Owner and the rate of fertilizer to be used shall be whatever amount is required to furnish the same amount of nitrogen as would be supplied by the 5-10-5.
- C. Commercial fertilizer shall be delivered in standard size bags of the manufacturer, showing weight, analysis and the name of the manufacturer. The Owner reserves the right to make tests of the material at any time and acceptance or rejection shall be based on the results of these tests. Rate of application shall be per manufacturer's recommendation.
- D. If the commercial fertilizer is not used immediately after delivery, the Contractor shall store it in a place designated by the Owner in such a manner that its effectiveness will not be impaired.
- E. Fertilizer for crown vetch ground cover shall consist of two separate types. First, an incomplete 0-20-20 farm grade type. Second, an incomplete 38-0-0 ureaform type.

2.4 SEED

- A. The grass shall be a mixture of the species and/or varieties specified, mixed in the proportions specified.
- B. The seed shall be fresh, re-cleaned and of the latest crop year. It shall conform to Federal and State standards. Each type of grass in the mixture shall meet or exceed the minimum percentage of purity and germination listed for that type of grass.

STANDARD MIXTURE (RESIDENTIAL AND MUNICIPAL PLANT SITE AREAS)

% By Weight in Mixture	Species or Variety	%Purity	%Germination
100	Hulled Bermuda Grass (Cynoden Dactolyn)	85	75

- Seed Shall be applied at a rate of 3 lbs per 1,000 square feet.

- If grass other than Bermuda Grass is established in residential areas, contractor shall seed or sod with matching turf species.

STANDARD MIXTURE (PASTURE FIELDS and Right of Way)

% By Weight in Mixture	Species or Variety
5	Green Sprangletop
20	Bermudagrass
20	Buffalograss (Texoka)
55	Sideoats Grama (Haskell)

- Seed Mix shall be applied at a minimum rate of 8.2 lbs per acre
- C. The balance of materials in an acceptable seed mixture, other than specified pure live seed, shall for the most part consist of non-viable seed, chaff, hulls, live seeds of crop plants and harmless inert matter. The percentage of weed seed shall not exceed one percent (1%) by weight for the mixture.
- D. Rates of application shall be the greater of the specified rate or the manufacturer's recommended rate.
- E. For seeding during the cool season, Contractor shall add Annual Cereal Rye Grain as a nurse crop at a rate of 50 lb/acre.
- F. All seed mixtures furnished under this item shall be mixed by vendor and shall be delivered in standard sized bags of the vendor showing weight, analysis and vendor's name.

2.5 LIME

- A. Lime shall be ground limestone containing not less than 85% of total carbonates and a size such that 90% will pass a No. 2 sieve and 50% will pass a No. 100 sieve.

PART 3 - EXECUTION

3.1 SOIL PREPARATION

- A. RESIDENTIAL AREAS:
1. Limit preparation to areas that will be planted in immediate future.
 2. Loosen subgrade to a minimum depth of 6". Remove stones bigger than 1" in any dimension and sticks, roots, rubbish, and other extraneous matter.
 3. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth.
 4. Mix soil amendments and fertilizers with topsoil at rates specified. Delay mixing of fertilizer if planting will not follow placing of topsoil mixture within a few days.
 5. Either mix soil before spreading or apply soil amendments on surface of spread topsoil and mix thoroughly into top 4" of topsoil before planting.
 6. Mix lime with dry soil before mixing in fertilizer. For lawns with a soil pH value less than 6.0, limestone should be added at a rate of 50 pounds per 1,000 square feet and worked into the topsoil.

7. Spread topsoil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Do not spread if material or subgrade is frozen.
8. Preparation of Unchanged Grades: Where lawns are to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for lawn and grass planting as follows: Till to a depth of at least 6". Apply soil amendments and initial fertilizers as specified and mix thoroughly into top 4" of soil. Remove high areas and fill in depressions; till soil to a homogenous mixture of fine texture, free of lumps, clods, stones, roots, and other extraneous matter.
9. Before preparing of unchanged areas, remove existing grass, vegetation, and turf. Dispose of such material outside of Owner's property; do not turn over into soil being prepared for lawns.
10. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted within immediate future. Remove trash, debris, stones larger than 1" diameter, and other objects that may interfere with planting or maintenance operations.
11. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry off before planting lawns. Do not create muddy soil.
12. Restore prepared areas to specified condition if eroded or otherwise disturbed after fine grading and before planting.

B. FIELDS AND NON-RESIDENTIAL AREAS:

1. Areas disturbed during construction shall be scarified, hand raked to true lines and a finely pulverized seed bed should be formed.
2. Fields that have been plowed shall not be stabilized with grass seed, but shall be covered with straw mulch.

3.2 SEEDING

- A. No seeding shall be done during windy weather or when the ground is non-tillable.
- B. Hydroseed slopes steeper than 10 percent. Flatter slopes may be mechanically seeded.
- C. To spread the dry seed mixture, the distributor shall be run over the ground as often as necessary to sow the seed at the specified rate. The grass seed shall then be covered, using the flexible toothed weeder or other suitable equipment, which will stir the ground to a depth of 1/4 inch. As soon as covering operation is completed, the area shall be lightly rolled and mulched.
- D. For "hydroseeding" the equipment shall be the tank type with agitator and sufficient hose to reach all disturbed areas. Seed, fertilizer and mulch may be mixed together and sown in one application. The mulch may be the type regularly used for this type of seeding operation.

3.3 RECONDITIONING LAWNS

- A. Recondition existing lawn areas damaged by Contractor's operations including storage of materials or equipment and movement of vehicles. Also recondition lawn areas where settlement or washouts occur or where minor re-grading is required.
- B. Recondition other existing lawn areas if indicated.

- C. Provide fertilizer, seed, and soil amendments as specified for new lawns and as required to provide satisfactorily reconditioned lawn. Provide new planting soil as required to fill low spots and meet new finish grades.
- D. Cultivate bare and compacted areas thoroughly to provide a good, deep planting bed.
- E. Remove diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations including oil drippings, stone, gravel, and other construction materials; replace with new topsoil.
- F. Where substantial lawn remains (but is thin), mow, rake, aerate if compacted, fill low spots, remove humps, cultivate soil, fertilize, and seed. Remove weeds before seeding. If weeds are extensive, apply selective chemical weed killers as required. Apply a seedbed mulch, if required, to maintain moist condition.
- G. Water newly planted areas and keep moist until new grass is established.

3.4 FERTILIZING

- A. In areas other than lawns, fertilizing will not be necessary unless requested by the Owner. The specified seed mixture shall be sown uniformly by means of mechanical distributors. The distributor shall be run over the ground as often as necessary to sow the seed at a rate recommended by the supplier. No seeding shall be done during windy weather or when the ground is non-tillable. The seed shall then be covered, using a flexible toothed weeder or other suitable equipment, by stirring the ground no deeper than one quarter inch (1/4"). Areas with a slope steeper than 1:5 shall be mulched.

3.5 MAINTENANCE AND PROTECTION

- A. The Contractor shall maintain and protect all seeded areas until final acceptance of the seeding portion of the Contract. Final acceptance of "seeding" will not be made until an acceptable uniform stand of grass is obtained in all new lawn except that the Owner, at his discretion may accept a portion or portions of the "seeding" at various times.
- B. Maintenance of lawns shall begin immediately after each area is planted and continue for the periods required to establish acceptable lawns, but no less than the following:
 - 1. Seeded lawns, at least 60 days, after date of substantial completion.
 - 2. If seeded in fall and not given full 60 days of maintenance, or if not considered acceptable at that time, continue maintenance during following spring until acceptable lawn is established.
- C. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regarding, replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.
- D. Any portions of areas of seeding which have not been accepted by the Owner and which fail to show a uniform stand of grass from any cause shall be re-seeded as before, except that commercial fertilizer shall be applied at only one-half (1/2) of the original rate. The seeding shall be repeated until the areas of seeding are satisfactorily covered with grass.

3.6 TREES, SHRUBS, AND GROUND COVER

- A. Trees, shrubs, and ground cover which are not designated for removal shall be replaced at the Contractor's expense with material of the same size and species, unless prior arrangements have been made with the property owner. All plants shall be from regular nursery stock and shall be planted in accordance with the instructions of the nursery.
- B. The following basic rules shall be applicable for planting trees and shrubs:
 - 1. Plant only freshly dug material.
 - 2. Exercise care in transportation and handling.
 - 3. Keep roots covered and moist at all times.
 - 4. Prune branches to compensate for root loss.
 - 5. Prepare holes sufficiently to allow for root spread.
 - 6. Use good soil around the roots.
 - 7. Pack soil around roots and water to firm the soil.
 - 8. Plant at the same depth at which material was grown.
 - 9. Stake material to prevent swaying.
 - 10. Mulch to conserve moisture.
 - 11. Water thoroughly once a week.

3.7 CLEANUP

- A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto surface of roads, walks, or other paved areas.

END OF SECTION 32 90 00

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SECTION 33 01 10 – DISINFECTION OF WATERLINES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section includes the disinfection of newly installed waterlines conveying potable water on the initial filling of pipe prior to being placed into service. This Section also includes the disinfection of connections to existing service lines. Water for disinfection to be provided by the Contractor unless otherwise shown on Drawings.

1.2 REFERENCES

- A. AWWA C651 Standard for Disinfecting Water Mains
- B. Texas Commission on Environmental Quality (TCEQ), Texas Administrative Code - Chapter 290, Drinking Water Standards Governing Drinking Water Quality and Reporting Requirements for Public Water Supply Systems.

1.3 SUBMITTALS

- A. Submit sample and test requirements and include the information as further described under paragraph 3.02 Field Quality Control of this Section.
- B. Submit Testing Procedures/Plans as indicated in Appendix A, Chlorine Residual Testing of AWWA C651.
- C. Submit Disposal of Heavily Chlorinated Water Procedures as indicated in Appendix B of AWWA C651.

1.4 MEASUREMENT AND PAYMENT

- A. Unless noted in the Bid Form, no separate payment will be made for work under this section. Include payment in unit price for applicable work as noted on the Bid Form.

PART 2 - PRODUCTS

2.1 MATERIALS AND/OR EQUIPMENT

- A. Chlorination agents to be in accordance with AWWA C651.

PART 3 - EXECUTION

3.1 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

- A. Disinfecting procedures to be in accordance with the requirements of AWWA C651 and as specified hereinafter. Minimal chlorine dosage to be 50 mg/l. Retain chlorine water in system until completion of hydrostatic tests. Minimum retention period to be 24 hours. Following chlorination, flush treated water from piping until replacement water has chlorine content not more than 0.1 mg/l in excess of residual in water from supply line, and in any event not more than 0.2 mg/l total.
- B. Furnish pump, pipe connections, and necessary apparatus, gauges, and meters. Furnish necessary labor, assistance, and chlorinating agent for disinfection. Prevent admission of contaminated water to previously disinfected lines. If contaminated water is admitted to previously disinfected lines, disinfect those lines at no additional cost to Owner.
- C. Application of chlorine to be in accordance with AWWA C651 Table 4 for the size pipe indicated.

3.2 FIELD QUALITY CONTROL

- A. Samples are to be taken in accordance with AWWA C651.
- B. Bacterial analysis and other specific test requirements are to be in accordance with TCEQ Chapter 290 and submitted for final analysis and approval. The Engineer is to be present during water purge for the samples required.
- C. Acceptance and placement in service will be based on the approved results returned from the TCEQ. If additional tests are required to comply with TCEQ 290, procedure is to be completed in accordance with paragraph 3.01. Additional testing is to be completed at no additional cost to the Owner.

END OF SECTION 33 01 10

SECTION 33 02 13 - WATER STORAGE TANK DISINFECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water tank disinfection.
2. Bacteriological testing.

B. Related Requirements:

1. Section 09 90 00 – Coating System for Steel Water Storage Tanks
2. Section 43 41 20 – Stand Pipe Storage Tank

1.2 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)/American Water Works Association (AWWA):
- B. ANSI/AWWA B300 - Hypochlorites
- C. ANSI/AWWA B301 - Liquid Chlorine.
- D. ANSI/AWWA C652 - Disinfection of Water Storage Facilities.
- E. American National Standards Institute (ANSI)/National Sanitation Foundation (NSF):
- F. ANSI/NSF 60 - Drinking water treatment chemicals-Health effects
- G. ANSI/NSF 61 - Drinking water system components-Health effects
- H. American Public Health Association (APHA)/American Water Works Association (AWWA)/Water Environment Federation (WEF)
- I. APHA/AWWA/WEF - Standard Methods for the Examination of Water and Wastewater.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Disinfection Procedure:

1. Submit description of procedure, including type of disinfectant and calculations indicating quantities of disinfectants required to produce specified chlorine concentration.
2. Submit method of disposal of highly chlorinated water.

3. Comply with Sections 3 and 4 of AWWA C652.
- C. Certify that disinfectants meet or exceed AWWA C652 requirements.
- D. Test and Evaluation Reports: Indicate results of bacteriological and residual chlorine laboratory test reports.
- E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- F. Qualifications Statement:
 1. Submit qualifications for applicator.

1.4 QUALITY ASSURANCE

- A. Provide qualified person to supervise use of liquid chlorine as defined in Part 2.
- B. Perform Work in compliance with AWWA C652.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- B. Store disinfectants according to manufacturer's recommendations and in a cool, dry place away from combustibles such as wood, rags, oils, and greases.
- C. Handle disinfectants according to manufacturer's safety precautions.

1.6 SEQUENCING AND SCHEDULING

- A. Commence disinfection after completion of the following:
 1. Completion and acceptance of internal coatings systems.
 2. Hydrostatic and pneumatic testing, pressure testing, functional and performance testing and acceptance of pipelines, pumping systems, structures, and equipment.

PART 2 - PRODUCTS

2.1 DISINFECTANTS

- A. Chlorine Forms: According to AWWA C652, Section 4.

2.2 WATER FOR DISINFECTION

- A. Water shall be clean and uncontaminated.

2.3 EQUIPMENT

- A. Furnish chemicals and equipment, such as pumps and hoses, to accomplish disinfection.
- B. Provide protection as required by AWWA for cross-connection to previously disinfected sources.

2.4 DISINFECTANTS

- A. Liquid Chlorine.
 - 1. Conforming to requirements of ANSI/AWWA B301.
 - 2. Certified for potable water application per ANSI/NSF 60 or ANSI/NSF 1 as applicable.
 - 3. May be used only if following conditions are met:
 - 4. Used in combination with appropriate gas-flow chlorination equipment to provide controlled high-concentration solution feed to the water to be chlorinated.
 - 5. Used under direct supervision of a person familiar and experienced physiological, chemical, physical properties of liquid chlorine and who is trained and equipped to handle any emergency that may arise.
 - a. Owner must approve qualifications of supervising person designated by Contractor.
 - b. When appropriate safety practices are observed to protect working personnel and the public.
- B. Sodium Hypochlorite
 - 1. Conforming to requirements of ANSI/AWWA B300.
 - 2. Certified for potable water application per ANSI/NSF 60 or ANSI/NSF 1 as applicable.
- C. Calcium Hypochlorite
 - 1. Conforming to requirements of ANSI/AWWA B300.
 - 2. Certified for potable water application per ANSI/NSF 60 or ANSI/NSF 1 as applicable.
 - 3. Sequestered calcium hypochlorite intended for swimming pool disinfection may not be used.

PART 3 - EXECUTION

3.1 GENERAL

- A. All facilities covered by this section shall be protected, cleaned, and flushed in accordance with the requirements herein. The specific facilities to be disinfected are also listed herein.
- B. Protection During Construction Period
 - 1. Observe Preventive and Corrective Measures During Construction as defined in ANSI/AWWA C651.
 - 2. Keep pipe clean and dry during storage and installation.
 - 3. Protect pipe during wet-trench installation and provide protection from flooding or storm events.
 - 4. In the event of contamination, clean and swab pipe in accordance with ANSI/AWWA C651.

- C. Disinfection procedures shall conform to ANSI/AWWA, EPA Guidance Manual, and this Specification.
 - 1. Disinfect surfaces of materials that will contact finished water, both during and following construction, using one of the methods specified in this section.
 - 2. Take care to avoid recontamination following disinfection.
 - 3. Allow freshwater and disinfectant solution to flow into pipe or vessel at a measured rate so that chlorinated water is mixed and at a consistent concentration meeting or exceeding the required solution strength.
 - 4. Do not place concentrated commercial disinfectant in pipeline or other facilities to be disinfected before it is filled with water.

3.2 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for application examination.
- B. Inspection:
 - 1. Conduct inspection of tank interior before beginning disinfection.
 - 2. Verify that tank is clean and free of polluting materials.
 - 3. Verify that tank pipe and vent connections are properly made and clear of obstructions.
 - 4. Verify that paint is thoroughly cured according to paint manufacturer's instructions.

3.3 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for application preparation.
- B. Furnish personnel working inside tank during disinfection with equipment to comply with Federal and State regulations for Work conducted in a hazardous atmosphere.
- C. Protect aquatic life and vegetation from damage from disinfectant solution purged from tank.

3.4 CLEANING AND FLUSHING FOR ALL FACILITIES

- A. Thoroughly clean and flush piping systems including supply, source and any appurtenant devices before performing disinfection.
- B. Cleaning agents used shall not contain hazardous substances or deleterious compounds that would cause a violation of water quality standards or cause health effects is subsequently introduced into the water supply during any disinfection or filling operations.
- C. Cleaning and Flushing of Piping and In-line Equipment.
- D. Flush all foreign matter from pipe in accordance with ANSI/AWWA C651.
- E. Provide hoses, temporary connections, ditches, and other conduits are necessary to dispose of flushing water without damage to adjacent structures or terrain.

- F. Use water suitable for disinfection.
- G. Flush service connections and hydrants. Flush distribution lines prior to flushing hydrants and service connections.
- H. Operate valves during flushing process at least twice during each flush.
- I. Cleaning of Tanks and Reservoirs
 - 1. Remove all materials not part of the operating facilities including temporary works, tools, and debris.
 - 2. Remove all water, dirt, paint chips, sediment, or foreign material and rinsing, vacuuming, or other removal techniques.
 - 3. Thoroughly clean walls, floors, and attached structures with high-pressure water jet and by sweeping, scrubbing, or other similar means.
- J. Cleaning shall
 - 1. Remove all deposits of foreign nature.
 - 2. Remove biological growths.
 - 3. Clean the slopes, walls, tops, and bottom.
 - 4. Avoid damage to the structure.
 - 5. Remove and avoid pollution or oil deposits by workers and equipment.

3.5 APPLICATION

- A. Use any one or combination of three methods for disinfecting tank in Section 4 of AWWA C652:
 - 1. Chlorination Method 1.
 - 2. Chlorination Method 2.
 - 3. Chlorination Method 3.
- B. Parts of structures, such as ceilings or overflows that cannot be immersed, shall be spray or brush disinfected.
- C. Provide signage and tagging at all outlets from the tank being disinfected to prevent discharge of highly chlorinated water.
- D. After applicable retention period, flush tank or reservoir with Membrane Permeate water with a minimum free chlorine residual of 0.5 milligram per liter to remove heavily chlorinated water.
- E. Disposal:
 - 1. Neutralize disinfectant solution before disposal.
 - 2. Legally dispose of disinfection solution off Project Site.
- F. Repair damage caused by disinfectant solution and disinfection procedures.

3.6 DISPOSAL OF FLUSHING WATER

- A. Dispose of flushing water in accordance with the Management of Water Used for Start-Up and Demonstration as defined in Section 01650.
- B. Heavily chlorinated water must be dechlorinated in accordance with ANSI/AWWA C651, C652, and C653 prior to release.
 - 1. See appendix of ANSI/AWWA standards for additional information.

3.7 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Upon completion of flushing, provide verification in the form of bacteriological sampling meeting the requirements of applicable ANSI/AWWA standard.
- C. Collection of Samples
 - 1. Contractor shall collect samples and deliver to Owner for laboratory analysis.
 - 2. Coordinate activities to allow samples to be taken in accordance with this Section.
 - 3. Provide valves at sampling points.
 - 4. Provide access to sampling points.
- D. Testing Equipment
 - 1. Clean containers, equipment, and connections used in sampling to make sure they are free of contamination.
 - 2. Obtain laboratory sampling bottles with instructions for handling from Owner.
- E. Chlorine Sampling and Analysis
 - 1. Collect samples in accordance with applicable ANSI/AWWA standard.
 - 2. Samples of Disinfecting Solution:
 - a. One sample per batch of disinfecting solution mixed and injected into pipe or vessel.
 - b. If mixed solution not used, sample structure or pipe being disinfected during or immediately after filling.
 - 3. Free Chlorine Residual Samples:
 - a. As required to establish concentrations at the beginning and end of retention period.
 - 4. Sampling Locations and Intervals
 - a. Sampling points shall be representative and accepted by Owner.
 - 5. Laboratory analysis to be performed by Owner. Samples will be analyzed for disinfectant residual concentration.
 - 6. If chlorine concentration testing results in disinfection concentrations not meeting the required standard, disinfecting procedures and verification testing shall be repeated until specified limits are met.
- F. Bacteriological Sampling and Analysis
 - 1. Collect samples in accordance with applicable ANSI/AWWA standard.
 - 2. Sampling Locations and Intervals
 - a. In accordance with applicable ANSI/AWWA Standard.
 - b. Sampling points shall be representative and accepted by Owner.

- c. If ANSI/AWWA Standard is not applicable or does not fully describe sampling procedure, utilize the following minimum requirements:
 - 1) A minimum of two (2) samples on two (2) consecutive days from each separable structure and every 1,000 feet of pipeline.
 - 3. Laboratory analysis to be performed by Owner. Samples will be analyzed for disinfectant residual and coliform concentrations using methods as described in the latest edition of Standard Methods for Examination of Water and Wastewater.
 - 4. If verification testing results in bacterially positive samples or disinfection concentrations not meeting the required standard, disinfecting procedures and verification testing shall be repeated until specified limits are met.
- G. Documentation
- 1. Secure from Owner' laboratory and submit, certified bacteriological reports on samples taken from system. Certify that sampling and testing procedures/results are in full compliance to ANSI/AWWA standards, and applicable requirements of the TCEQ.

END OF SECTION

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SECTION 33 11 16 - BURIED FLEXIBLE RESTRAINT DUCTILE IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install buried ductile iron pipe and fittings complete as shown on the Drawings and as specified herein.
- B. Unless otherwise specified, buried pipe shall be restrained, flexible joint as described by FlexRing, Field FlexRing, LokRing or Fast-Grip joints, and as manufactured by American Ductile Iron Pipe, or Engineer-approved equal.

1.2 SUBMITTALS

- A. Submit to the OWNER'S Representative, within thirty (30) days of the Effective Date of the Agreement, the name of the pipe and fitting supplier and a list of materials to be furnished.
- B. Submit to the OWNER'S Representative, as provided in SECTION 01300 - SUBMITTALS, detailed working drawings and schedules of all ductile-iron pipe and fittings required.
- C. Prior to each shipment of pipe, submit certified test reports that the pipe for this Contract was manufactured and tested in accordance with the ASTM and ANSI/AWWA Standards specified herein.
- D. Number of Copies: Submit six (6) copies of each submittal, unless otherwise indicated. ENGINEER will return two (2) copies.

1.3 QUALITY ASSURANCE

- A. All ductile-iron pipe and fittings shall be from a single manufacturer. All ductile-iron pipe to be installed under this Contract may be inspected at the foundry for compliance with these Specifications by an independent testing laboratory provided by the OWNER. The CONTRACTOR shall require the manufacturer's cooperation in these inspections. The cost of foundry inspection of all pipe approved for this Contract, plus the cost of inspection of a reasonable amount of disapproved pipe will be borne by the OWNER.
- B. Inspection of the pipe will be made by the OWNER'S Representative after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the job.

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs 60,000 psi Tensile Strength.
- B. American Water Works Association (AWWA)
 - 1. AWWA C104- Cement-Mortar Lining for Ductile-Iron Pressure Pipe and Fittings.
 - 2. AWWA C105 -Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.
 - 3. AWWA C110- Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in. for Water and Other Liquids.
 - 4. AWWA C111 -Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 5. AWWA C115 - Standard for Flanged Ductile-Iron Pipe with Threaded Flanges.
 - 6. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
 - 7. AWWA C153 -Ductile-Iron Compact Fittings, 3 in. through 12 in. for Water and Other Liquids.
 - 8. AWWA C600- Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.
 - 9. AWWA C651 -Disinfection Water Mains
- C. American National Standards Institute (ANSI)
 - 1. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
- D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Ductile iron pipe shall conform to AWWA C151, Class 53 minimum.
- B. Ductile iron fittings shall conform to AWWA C110 for sizes 3 in. through 48 in., or C153 for sizes 3 in. through 12 in.
- C. All pipe and fittings shall have a bituminous outside coating in accordance with AWWA C151 and C110, respectively. All pipe and fittings shall be cement-mortar lined and seal coated in accordance with AWWA C104. The type and brand of interior lining shall be clearly marked on the outside of the pipe and fittings. Except as authorized by the OWNER'S Representative, only one type and brand of pipe lining shall be used on a given project.
- D. Joints for pipe shall be flexible, restrained, push-on joints per manufacturer.
- E. AWWA C110 for fittings. The pipe flanges shall be flat faced and suitable for 150 psi working pressure. Gaskets shall be ethylene propylene (EPDM), 1/8 in. thick, full face and meeting the material requirements of AWWA C115.

- A. Encasement shall be 8 mil, blue in color, polyethylene tube conforming to AWWA C105.
- B. Exposure to weather shall be kept to a minimum, and in no case shall it exceed ten (10) days. The Class of polyethylene used shall be approved by the OWNER'S Representative.

PART 3 - EXECUTION

3.1 LAYING DUCTILE IRON PIPE AND FITTINGS

- A. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe, lining or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying and no piece shall be installed which is found to be defective. Any damage to the pipe linings or coatings shall be repaired as directed by the OWNER'S Representative. Handling and laying of pipe and fittings shall be in accordance with the manufacturer's instruction and as specified herein.
- B. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when laid, shall conform to the lines and grades required. Ductile iron pipe and fittings shall be installed in accordance with requirements of AWWA C600, except as otherwise provided herein. A firm, even bearing throughout the length of the pipe shall be constructed by tamping pipe bedding material conforming Drawings. Blocking will not be permitted. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner by the CONTRACTOR, at his own expense.
- C. All pipe shall be sound and clean before laying. When laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plugs or other approved means. Good alignment shall be preserved in laying. The deflection at joints shall not exceed 75 percent of that recommended by manufacturer. Fittings, in addition to those shown on the Drawings, shall be provided, if required, for crossing utilities which may be encountered upon opening the trench or other conditions requiring alignment changes. Solid sleeves shall be used only where approved by the OWNER'S Representative.
- D. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be jointed with a bell shall be beveled to conform to the manufactured spigot end. Cement lining shall be undamaged.
- E. The CONTRACTOR shall have on hand at the start of the job, one 1/16 bend and one 1/8 bend for each size of pipe. These shall be used as job conditions require.
- F. Concrete thrust blocks shall not be used on the project without the OWNER'S approval.

3.2 RESTRAINED FLEXIBLE JOINT PIPE

- A. The flexible joint pipe shall be installed in accordance with the manufacturer's recommendations. In addition, the installed deflection shall be limited to 12 degrees per joint and provisions shall be made where required to prevent flotation or buoyancy of the pipe.

- A. Couplings shall be installed at all building connections and where otherwise shown. Couplings shall consist of flexible restraints on both ends. Couplings shall not be assembled until adjoining push-on joints have been assembled. After installation, apply a heavy bitumastic coating to bolts and nuts.

3.4 POLYETHYLENE ENCASEMENT

- A. The polyethylene encasement shall be installed in accordance with either method specified in AWWA C105.

3.5 TESTING (Pressure Piping)

- A. Furnish all necessary equipment and labor for conducting a pressure test and a leakage test on the pipelines. The procedures and method for conducting the pressure tests and leakage tests shall be approved by the OWNER'S Representative.
- B. Make any taps and furnish all necessary caps, plugs, etc., as required in conjunction with testing a portion of the pipe between valves. Furnish a test pump, gages and any other equipment required in conjunction with conducting the hydrostatic tests.
- C. All pipelines shall be subjected to testing in accordance with SECTION 01666 - TESTING OF PIPELINES.

3.6 CLEANING

- A. At the conclusion of the work thoroughly clean all of the new pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. If, after this cleaning, obstructions remain, they shall be removed.

END OF SECTION 33 11 16

SECTION 33 12 16 – BURIED VALVES AND VALVE BOXES

PART 1 - GENERAL

- A. All products incorporated into the Work, including temporarily installed items for flushing or testing, shall be in full compliance with the Reduction of Lead in Drinking Water Act (the "Act") enacted on January 4, 2011. In accordance with the Act the maximum allowable lead content of the wetted surfaces of pipes, pipe fittings, plumbing fittings and fixtures is a weighted average of 0.25%. The Contractor shall be solely responsible for incorporating into the Work only products that comply with the Act. If requested, the Contractor shall provide an affidavit certifying that all products incorporated into the Work are in compliance with the Act.

1.2 SUMMARY

- A. Section Includes:
1. Valves.
 2. Valve boxes.
- B. Related Requirements:
1. Section 33 11 13 - Public Water Utility Distribution Piping: Piping trenching, backfilling, and compaction requirements.
 2. Section 33 12 19 - Water Utility Distribution Fire Hydrants: Execution requirements for fire hydrants.
 3. Section 33 13 00 - Disinfecting of Water Utility Distribution: Flushing and disinfection requirements.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. As specified in Section 01 20 00 - Price and Payment Procedures: Unit Prices.

1.4 REFERENCE STANDARDS

- A. American Water Works Association:
1. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
 2. AWWA C515 – Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
 3. AWWA C550 - Protective Interior Coatings for Valves and Hydrants.
 4. AWWA C605 – Underground Installation of PVC Pressure Pipe and Fittings for Water.
- B. NSF International:
1. NSF 61 - Drinking Water System Components - Health Effects.

2. NSF 372 - Drinking Water System Components - Lead Content.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer's latest published literature. Include illustrations, installation and maintenance instructions, and parts lists.
- C. Shop Drawings: Submit description of proposed installation.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of valves.

1.7 QUALITY ASSURANCE

- A. Perform Work according to AWWA standards.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves and accessories for shipment according to applicable AWWA standards.
- B. Seal valve and ends to prevent entry of foreign matter.
- C. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- D. Storage:
 - 1. Store materials in areas protected from weather, moisture, or other potential damage.
 - 2. Do not store materials directly on ground.
- E. Handle products carefully to prevent damage to interior or exterior surfaces.

PART 2 - PRODUCTS

2.1 BUTTERFLY VALVES

- A. Manufacturers: Mueller Linesal III 150 B

- B. Description
1. Comply with AWWA C509, C515
 2. Materials:
 - a. Body: Ductile Iron
 3. Seats: Resilient
 4. Stem
 - a. Type: Non-rising.
 - b. Material: Bronze.
 5. Operation:
 - a. Square operating nut.
 - b. Open counterclockwise unless otherwise indicated.
 - c. Provide horizontally-mounted gear operator for buried service, 30 turn operation
 6. Bonnet Bolts: 316 Stainless Steel.
 7. Coatings:
 - a. Comply with AWWA C550.
 - b. Interior and exterior.

2.2 RESILIENT WEDGE GATE VALVES

- A. Manufacturers: Kennedy KS-FW, Mueller 2360 or approved equal.
- B. Description:
1. Comply with AWWA C509, C515.
 2. Materials:
 - a. Body: Ductile iron.
 3. Seats: Resilient.
 4. Stem:
 - a. Type: Non-rising.
 - b. Material: Bronze.
 5. Operation:
 - a. Square operating nut.
 - b. Open counterclockwise unless otherwise indicated.
 6. Bonnet Bolts: Stainless Steel.
 7. Coatings:
 - a. Comply with AWWA C550.
 - b. Interior and exterior.

2.3 VALVE BOXES

- A. Manufacturers: Clow F-2454, Bibby-Ste-Croix or approved equal.
- B. Description: Valve boxes shall be 5 ¼ inches in diameter, coated with asphaltic material.
- C. Type: 2 piece, cast iron; extension type; slide adjustment for driveway and road installation. Screw type for all others.
- D. Covers: Marked "WATER".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Determine exact location and size of valves from Drawings.
- C. Verify that invert elevations prior to excavation and installation of valves are as indicated on Drawings.

3.2 INSTALLATION

- A. Install valves in conjunction with pipe laying.
- B. Set valves plumb.
- C. Provide buried valves with valve boxes installed flush with finished grade.

3.3 FIELD QUALITY CONTROL

- A. Pressure test system according to Section 01 67 00.

END OF SECTION 33 12 16

SECTION 40 05 00 – PROCESS PIPING VALVES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes general duty valves for process piping systems. Special purpose valves not identified within are specified in individual Division 33 and/or Division 40 Specification Sections.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this section.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data, including body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions.
- C. Furnish catalog data, weight information, and an affidavit of compliance of referenced standards (i.e. AWWA, ASTM, ANSI, etc.)
- D. Manufacturer shall perform tests as described in AWWA C509 and submit certified test results demonstrating compliance.
- E. Provide electrical wiring diagrams for power & control or air instrumentation diagrams, as applicable.

1.4 QUALITY ASSURANCE

- A. Comply with the requirements specified in Division 1.
- B. American Society of Mechanical Engineers (ASME) Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.
- C. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Compliance: Comply with the various MSS Standard Practices referenced.
- D. American Water Works Association (AWWA).

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Preparation For Transport: Prepare valves for shipping as follows:
 - 1. Ensure valves are dry and internally protected against rusting and corrosion.
 - 2. Protect valve ends against damage to threads, flange faces, and weld ends preps.
 - 3. Set valves in best position for handling. Set globe and gate valves closed to prevent rattling; set ball and plug valves open to minimize exposure of functional surfaces; set butterfly valves closed or slightly open; and block swing check valves in either closed or open position.
- B. Storage: Use the following precautions during storage:
 - 1. Do not remove valve end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect valves from weather. Store valves indoors. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is necessary, support valves off the ground or pavement in watertight enclosures.
- C. Handling: Use a sling to handle valves whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels and stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Gate Valves
 - 1. Kennedy Valve Mfg. Co.
 - 2. Mueller Valve
 - 3. American Flow Control
 - 4. Watts (3 inch and smaller)
 - 5. Crane (3 inch and smaller)
- B. Ball Valves
 - 1. Watts
 - 2. Crane
 - 3. Nibco
 - 4. Spears (PVC valves)
 - 5. Chemline (for chemical applications)
 - 6. Hayward (for chemical applications)
- C. Butterfly Valves
 - 1. Keystone
 - 2. Nibco
 - 3. Dezurik
 - 4. Pratt
- D. Check Valves
 - 1. Crane
 - 2. Clow Corp

3. G-A Industries
 4. Chemline (for chemical applications)
 5. Hayward (for chemical applications)
- E. Plug Valves
1. Powell
 2. Pratt
 3. Dezurik
- F. Diaphragm Valves (for chemical applications)
1. Hayward
 2. Chemline, or equal
- G. Mud Valves
1. Troy
 2. Kennedy
 3. Clow
- H. Multi-Port Plug Valve
1. Pratt
 2. Dezurik
 3. Or equal

2.2 VALVE FEATURES, GENERAL

- A. Valve Design: Rising stem or non-rising stems
1. Rising stem valves shall not be used where headroom prevents full extension of rising stems.
- B. Pressure and Temperature Ratings: As required to suit system pressures and temperatures.
- C. Sizes: Same sizes as upstream pipe, unless otherwise indicated.
- D. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
- E. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
- F. End Connections: As indicated in the valve specifications.
1. Threads: Comply with ANSI B1.20.1.
 2. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.

2.3 GATE VALVES

- A. Valves shall be iron body resilient seated valves complying with AWWA C-509. Unless otherwise noted on the plans they shall be outside stem and yoke, flanged joint ends with zinc-plated bolts and nuts.

- B. O-ring stem seal shall turn left-hand to open with handwheel operators.
- C. Shall be provided with handwheel operator unless otherwise noted.

2.4 BALL VALVES

- A. Ball Valves, rated for 150 psi, 600 psi WOG pressure; two-piece construction, with bronze body conforming to ASTM B 62, standard (or regular) port, chrome-plated brass ball (provide stainless steel where noted), replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl-covered steel handle.
- B. PVC Ball Valves: Shall be of schedule 80, CPVC construction, rated for 235 psi (up to 4") and 150 psi minimum working pressure (above 4"). Shall have EPDM seals. Provide Spears True Union 2000 Industrial Ball Valves, or equal.

2.5 BUTTERFLY VALVES

- A. Butterfly Valves, MSS SP-67; rated at 200 psi; cast iron body conforming to ASTM A 126, Class B. Provide valves with field replaceable EPDM sleeve, nickel-plated ductile iron disc, stainless steel stem, and EPDM O-ring stem seals. Provide lever operators with locks for sizes 2 through 6 inches and gear operators with position indicator for sizes 8 through 24 inches. Provide lug or wafer type as indicated. Drill and tap valves on dead-end service or requiring additional body strength.

2.6 CHECK VALVES

- A. Swing Check Valves shall conform in all respects to AWWA C508. All valves shall have flanges conforming to ANSI B16., Class 125. All swing-check valves are to be equipped with an outside lever and weight assembly. Shall be suitable for mounting in horizontal or vertical orientation (refer to drawings). Where outside lever and weight assemblies are not adequate to provide sufficient back-pressure or closing pressure, an outside spring actuated lever arm shall be provided.
- B. Body, cover, disc, and levers shall be cast iron. Seat shall be stainless steel and renewable seating ring shall be Buna-N. Pivot shaft shall be stainless steel. Fasteners holding seating ring in place shall be stainless steel.
- C. Where cushion cylinder is specified, it shall be bronze and pivot shaft shall be sealed off from the cushion cylinder through a stuffing box. Check valve shall be independently adjustable for disc closing speed and for range over which cushion cylinder operates.
- D. Check valves with limit switch: Limit switch and check valve shall be provided by single supplier with switch factory mounted, adjusted, and tested prior to delivery to project site. Switch shall be rated for 120 VAC, shall be UL listed assembly, plunger actuated and DPDT double break. Switch mounting bracket and hardware shall be stainless steel.

2.7 PLUG VALVES-SLUDGE AND WASTEWATER APPLICATIONS

- A. All plug valve shall be of the tight-closing, resilient-faced plug type and shall be of bi-directional eccentric seating such that the opening movement of the closing member results in the closing member rising off the body seat contact.
- B. Valves shall be drop tight at rated pressure of 175 psi (3"-12") and 150 psi (14"-24"). Valves shall be satisfactory for applications involving throttling service and/or frequent operation and for applications involving open/closed operation.
- C. Valve bodies shall be constructed of cast iron ASTM A-126 Class B. Flanges shall be faced and drilled in accordance with ANSI B16.1, Class 125. Mechanical joint end bodies shall be in full compliance with ANSI A21.11.
- D. Plug valves 6" and larger shall be equipped with gear actuators and handwheels. Smaller than 6" shall be equipped with square heads and one wrench for every 5 valves.

2.8 VALVES – CHEMICAL APPLICATION

- A. Diaphragm valves: Shall be suitable for modulating and ON/OFF service. Shall include diaphragm travel stop, position indication, union type connections, and viton diaphragms, unless otherwise noted. Shall be of CPVC construction.
- B. Check Valves: Shall be of ball check type and suitable for mounting horizontal or vertical. Shall be of CPVC construction with Viton seals, unless otherwise noted. Shall be true union ball check valves.
- C. Ball Valves: Shall be of CPVC construction. Shall be rated for 150 psi minimum working pressure. Shall have Viton seals with Teflon PTFE ball seats. Ball valves in chemical applications where off-gassing may occur (i.e. Sodium Hypochlorite applications) shall be vented or shall be provided with a modified ball on one side to allow pressure release.

2.9 AIR RELEASE VALVES

- A. Air release valve shall be a compound lever type suitable for service up to 150 psi.
- B. Shall have a stainless steel float. All internal parts and mechanisms shall be stainless steel and viton. Seats shall be stainless steel with viton sealing mechanism.
- C. The valve shall allow the steady release of air and seal tight, without leakage at all times.
- D. Orifice and size shall be as shown on the plans or, if not shown, as directed by the Engineer.

2.10 SEWAGE AIR RELEASE VALVES

- A. Shall be float operated, compound lever type suitable for wastewater service up to 150 psi.

- B. Shall have stainless steel internals and trim. Seat shall be stainless steel with a BUNA-N sealing mechanism.
- C. The valve shall allow the steady release of air and seal tight, without leakage at all times.
- D. The body shall be cast iron conforming to ASTM A126 Class B.
- E. Each valve shall be provided with a stainless-steel isolation ball valve on the inlet and a backflush attachment consisting of stainless steel ball valves and 5' rubber hose w/ quick disconnects.
- F. Orifice and size shall be as shown on the plans or, if not shown, as directed by the Engineer.

2.11 KNIFE GATE VALVES

- A. Valves shall be cast iron body (ASTM A126, class B). Unless otherwise noted on the plans they shall be outside stem and yoke, flanged joint ends with zinc-plated bolts and nuts.
- B. O-ring stem seal shall turn left-hand to open with handwheel operators.
- C. Shall be provided with handwheel operator unless otherwise noted.
- D. Bi-directional, drip-tight shutoff to 150 psi. Urethane liner. Gate material min. type 316 stainless steel.
- E. Shall be DeZurik, KGU Urethane Knife Gate Valve, or equal.

2.12 MUD VALVES

- A. Valves shall be cast iron (ASTM A126, class B) body, frame, plug, and yoke with zinc-plated bolts and nuts. Operating stem, lift nut, and seat ring shall be bronze (B421).
- B. Plug seat shall be seamless molded, tapered resilient ring (BUNA-N)
- C. Shall turn left to open with rising stem (unless otherwise noted). Shall be provided with stainless steel extension stem and stem guides with cast iron handwheel operator.
- D. Drip tight shut-off against a minimum of 15 feet of seated or unseated head.
- E. Provide two-part epoxy coating per Specification Section 09900.

2.13 MULTI-PORT PLUG VALVE – SLUDGE AND WASTEWATER APPLICATION

- A. Valve body and bonnet shall be Cast Iron (ASTM A126, Class B). Flanges shall be faced and drilled in accordance with ASME/ANSI B16.1, Class 125.
- B. Valve shall be of the Multi-Port non-lubricated concentric type with a totally encapsulated plug. The elastomer shall be suitable for the service intended and outlined on the drawings.

- C. Valve shall be three-way, three port, 180° turn Style G three position port positions.
- D. Valve stem shall be provided with a gear operator and fitted with travel stops. Gear operators shall require single handwheel operation only.
- E. Flow direction shall be provided with an Open/Close indicator.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior through the end ports, for cleanliness, freedom from foreign matter and corrosion. Remove special packing materials, such as blocks used to prevent disc movement during shipping and handling.
- B. Actuate valve through an open-close and close-open cycle. Examine functionally significant features, such as guides and seats made accessible by such actuation. Following examination, return the valve closure member to the shipping position.
- C. Examine threads on both the valve and the mating pipe for form (i.e., out-of-round or local indentation) and cleanliness.
- D. Examine mating flange faces for conditions which might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.
- E. Prior to valve installation, examine the piping for cleanliness, freedom from foreign materials, and proper alignment.
- F. Replace defective valves with new valves.

3.2 VALVE ENDS SELECTION

- A. Select valves with ends which can be adapted to connections as shown on drawings.

3.3 VALVE INSTALLATIONS

- A. General Application: Use gate, ball, plug, and butterfly valves for shut-off duty; use plug and butterfly throttling duty.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves to allow equipment removal and disassembly of piping without system shut down. Unions shall be required where necessary.

- D. Install valves in horizontal piping with stem at or above the center of the pipe, unless otherwise shown.
- E. Install valves in a position to allow full stem movement.
- F. Installation of Check Valves: Install for proper direction of flow as follows, unless otherwise noted:
 - 1. Swing Check Valves: Horizontal position with hinge pin level.
- G. Valves shall be field painted as specified in Section 09900.

3.4 THREADED CONNECTIONS

- A. Note the internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.
- B. Align threads at point of assembly.
- C. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).
- D. Assemble joint, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.5 FLANGED CONNECTIONS

- A. Align flange surfaces parallel.
- B. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using a torque wrench.
- C. For dead-end service, butterfly valves require flanges both upstream and blind downstream for proper shutoff and retention.

3.6 AIR RELEASE/SEWAGE AIR RELEASE VALVE INSTALLATION

- A. The air release valves shall be installed at the locations on the drawings. Pipe taps, joints and fittings shall be made up as described in the appropriate individual sections or as necessary to provide a complete and working installation.
- B. All air release valves shall be installed with an isolation valve unless otherwise noted.
- C. Valves shall be installed as per the manufacturer's recommendations, valve leaking fluids shall be repaired or replaced as determined by the Engineer.

3.7 FIELD QUALITY CONTROL

- A. Tests: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.

3.8 ADJUSTING AND CLEANING

- A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare valves to receive finish painting or insulation.
- B. Contractor shall field test each valve upon completion of piping systems to field verify valves are properly adjusted and sealing leak-tight.

END OF SECTION 40 05 00

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SECTION 40 05 07 – HANGERS AND SUPPORTS FOR PROCESS PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe hangers and supports.
 - 2. Hanger rods.
 - 3. Structural attachments.
 - 4. Pipe guides.
 - 5. Formed steel channel.

1.2 REFERENCE STANDARDS

- A. American Society of Mechanical Engineers:
 - 1. ASME B31.1 - Power Piping.
 - 2. ASME B31.9 - Building Services Piping.
- B. ASTM International:
 - 1. ASTM A36 - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A36M - Standard Specification for Carbon Structural Steel. ASTM A47 - Standard Specification for Ferritic Malleable Iron Castings.
 - 3. ASTM A47M - Standard Specification for Ferritic Malleable Iron Castings. ASTM A576 - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
 - 4. ASTM A181 - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.
 - 5. ASTM A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.
- C. American Welding Society:
 - 1. AWS D1.1 - Structural Welding Code Steel - Reference Manual.
- D. Manufacturers Standardization Society of the Valve and Fittings Industry:
 - 1. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacturer, Selection, Application, and Installation.
 - 2. MSS SP-90 – Guidelines on Terminology for Pipe Hangers and Supports

1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with piping and equipment connections specified in other Sections and indicated on Drawings.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer's catalog data including load capacity.
- C. Shop Drawings: Indicate system layout with location - including critical dimensions, sizes, and pipe hanger and support locations - and detail of trapeze hangers, anchors, and guides.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Welders' Certificate: Submit welders' certification of compliance with ASME Section IX or AWS D1.1 as appropriate to the work, verifying qualification within previous 12 months.
- F. Delegated Design Submittals:
 - 1. Submit signed and sealed Shop Drawings with design calculations and assumptions for load carrying capacity of trapeze, multiple pipe, and riser support hangers.
 - 2. Indicate calculations used to determine load carrying capacity of trapeze, multiple pipe, and riser support hangers.
 - 3. Submit calculations sealed by a registered professional engineer.
- G. Manufacturers' Instructions: Submit special procedures and assembly of components.
- H. Qualifications Statements:
 - 1. Submit qualifications for manufacturer, fabricator, installer, and licensed professional.
 - 2. Submit manufacturer's approval of installer.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Section 017000 - Execution and Closeout Requirements: Requirements for maintenance materials.
- B. Spare Parts:
 - 1. Furnish one set of manufacturer's recommended spare parts.
- C. Tools: Furnish special wrenches and other devices required for Owner to maintain.

1.6 QUALITY ASSURANCE

- A. Perform Work according to AWS D1.1 for welding hanger and support attachments to building structure.
- B. Maintain copies of each standard affecting the Work of this Section on-Site.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years' documented experience.

- B. Fabricator: Company specializing in fabricating products specified in this Section with minimum three years' documented experience.
- C. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience and approved by manufacturer.
- D. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in State of New York.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on-Site in original factory packaging, labeled with manufacturer's identification.
- C. Protect products from weather and construction traffic, dirt, water, chemical, and damage by storing in original packaging.

1.9 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Provide ventilation in areas receiving solvent-cured materials.

1.10 EXISTING CONDITIONS

- A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

1.11 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish five-year manufacturer's warranty for pipe hangers and supports.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Manufacturers:
 - 1. AAA Technology & Specialties Co., Inc.
 - 2. Bergen-Power Pipe Supports
 - 3. B-Line Systems Inc., a division of Cooper Industries

4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Piping Technology & Products
8. Grinnel Corp
9. GS Metals Corp
10. National Pipe Hanger Corporation
11. PHS Industries, Inc.
12. Anvil International
13. Glope Pipe Hanger Products Incorporated
14. PHD Manufacturing, Inc.
15. Substitutions: Section 016000 - Product Requirements.

B. Description:

1. Conform to ASME B31.1, ASME B31.9 and MSS SP58 as applicable.
2. Provide means of vertical adjustment after erection.
3. Pipe Sizes 1/2 to 1-1/2 in: ASTM A47, malleable iron or ASTM A36, steel, adjustable swivel, split ring.
4. Pipe Sizes 2 in and Larger: ASTM A36, steel, adjustable, clevis.
5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
6. Wall Support for Pipe Sizes 3 in and Smaller: Cast iron J-hook.
7. Wall Support for Pipe Sizes 4 in and Larger: Welded steel bracket.
8. Vertical Support: Riser clamp. For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500)
9. Floor Supports: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
10. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system sections install the following types:
 - a. Steel turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads
 - b. Swivel turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings
 - c. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments
11. Building Attachments: Unless otherwise indicated and except as specified in piping system sections, install the following types:
 - a. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling,
 - b. Top-beam C-Clamps (MSS Type 19): for use under roof installations with bar-joist construction to attach to top flange of structural shape
 - c. Side-beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles
 - d. Center-beam clamps (MSS Type 21): For attaching to center of bottom of flange of beams
 - e. Welded beam attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large
 - f. C-Clamps (MSS Type 23): For structural shapes
 - g. Top-beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge
 - h. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams

- i. Steel-Beam Clamps with eye nuts (MSS (type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions
 - j. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel
 - k. Welded-steel brackets: For support of pipe is from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - 1) Light (MSS Type 31): 750 lb (340 kg)
 - 2) Medium (MSS Type 32): 1500 lb (680 kg)
 - 3) Heavy (MSS Type 33): 3000 lb (1360 kg)
 - l. Side beam brackets (MSS Type 34): For sides of steel or wooden beams
 - m. Plate lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required
 - n. Horizontal travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited
 - 12. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system sections
 - 13. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system sections
- C. Performance and Design Criteria:
- 1. Pipe Hangers:
 - a. Allow for expansion and contraction of piping while eliminating undue stress on piping appurtenances and equipment.
 - b. Provide linkage to permit lateral or axial movement where anticipated.
 - c. Where horizontal pipe movement is greater than 1/2 in, or where hanger rod deflection from the vertical is greater than 4 degrees from cold to hot position of pipe, hanger rod and structural attachment shall be offset to maintain rod vertical in hot position.
 - 2. Heat Transmission: Design supports, hangers, anchors, and guides to prevent excessive heat from being transmitted to building structure, equipment, or piping appurtenances.
 - 3. Riser Supports: Support risers on each floor with riser clamps and lugs, independent of connected horizontal piping.
 - 4. Point Loads:
 - a. Support plastic piping containing meters, valves, appurtenances, and other point loads on both sides.
 - b. Avoid point loads on plastic piping by providing extra wide pipe saddles or galvanized steel shields.
 - 5. Noise Reduction: Wrap copper tubes located within buildings with a 2-in-wide strip of rubber at each pipe support, bracket, clip, or hanger.
 - 6. Galvanized, Metallic Coatings: Pregalvanized or hot dipped
 - 7. Nonmetallic Coatings: Plastic coating, jacket, or liner

2.2 HANGER RODS

- A. Hanger Rods:
- 1. ASTM A576, steel.
 - 2. Threaded both ends, threaded one end, or all-thread.
 - 3. Diameter: ASME B31.1.

2.3 STRUCTURAL ATTACHMENTS

- A. Manufacturers:
 - 1. B-Line Systems Inc, a division of Cooper Industries
 - 2. GS Metals Corp
 - 3. Power-Strut, Div. Tyco International LTD
 - 4. ERICO International Corporation
 - 5. Thomas & Betts Corporation
 - 6. Tolco Inc.
 - 7. Grinnel Mechanical Products
 - 8. Unistrut
 - 9. Substitutions: Section 01 60 00 - Product Requirements.
- B. Concrete Inserts:
 - 1. Manufacturers:
 - a. ERICO International Corporation
 - b. National Pipe Hanger Corporation
 - c. Piping Technology & Products
 - d. Unitron Products, Inc.
 - e. Hilti
 - f. Substitutions: Section 01 60 00 - Product Requirements.
 - 2. Description:
 - a. Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms.
 - b. Size inserts to suit threaded hanger rods.
- C. Mounting Brackets: ASTM A36, welded steel.
- D. Beam Clamps:
 - 1. Manufacturers:
 - a. B-Line
 - b. ERICO International Corporation
 - c. Grinnell Mechanical Products
 - d. Substitutions: Section 016000 - Product Requirements.
 - 2. ASTM A36, steel or ASTM A181, forged steel; MSS SP-58.
 - 3. Clamp Size: Based on load to be supported and load configuration.
 - 4. Anchoring: Locknuts and cup-point set screws.
 - 5. Reversible top or bottom flange.
- E. Riser Clamps:
 - 1. Manufacturers:
 - a. B-Line
 - b. ERICO International Corporation
 - c. Grinnell Mechanical Products
 - d. Substitutions: Section 016000 - Product Requirements.
 - 2. ASTM A36, steel.
 - 3. Support of Copper Tubing: Provide copper-plated clamps.
- F. Offset Clamps:
 - 1. Manufacturers:

- a. B-Line
 - b. ERICO International Corporation
 - c. Grinnell Mechanical Products
 - d. Substitutions: Section 016000 - Product Requirements.
2. Double leg, two-piece.

G. Coatings: Manufacturers standard finish, unless bare metal surfaces are indicated

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used
- 1. Manufacturer:
 - a. Hilti, Inc.
 - b. ITW Ramset/Red Head
 - c. Masterset Fastening Systems, Inc.
 - d. MKT Fastening, LLC
 - e. Powers Fasteners
- B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- 1. Manufacturer:
 - a. B-Line Systems, Inc, Division of Cooper Industries
 - b. Empire Industries, Inc.,
 - c. Hilti, Inc,
 - d. ITW Ramset/Red Head
 - e. MKT Fastening, LLC

2.5 PIPE GUIDES

- A. Intermediate Guides:
- 1. Pipes 6 in and Smaller: Pipe clamp with oversize pipe sleeve.
 - 2. Pipes 8 in and Larger: U-bolts with double nuts.
- B. Alignment Guides:
- 1. Pipes 8 in and Smaller: Galvanized steel Sleeve type.
 - 2. Pipes 10 in and Larger: Galvanized steel Roller type.

2.6 FORMED STEEL CHANNEL

- A. Manufacturers:
- 1. B-Line.
 - 2. Unistrut
 - 3. Substitutions: Section 016000 - Product Requirements.
- B. Description:

1. Galvanized 12-gage-thick steel.
2. Include holes 1-1/2 in o.c.

2.7 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop or field-fabricated pipe-support assembly made of steel channels and other components
- B. Manufacturers:
 1. B-Line Systems Inc., a division of Cooper Industries
 2. ERICO/Michigan Hanger Co., ERISTRUT Div
 3. GS Metals Corp
 4. Power-Strut Div; Tyco International Ltd
 5. Thomas & Betts Corporation
 6. Tolco Inc.
 7. Unistrut Corp; Tyco International LTd

2.8 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized
- B. Grout: ASTM C 1107, factory-mixed and packaged, dry, hydraulic cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications
 1. Properties: Nonstaining, noncorrosive, and nongaseous
 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 013000 - Administrative Requirements: Requirements for installation examination.
- B. Verify field dimensions as indicated on Drawings.

3.2 INSTALLATION

- A. Obtain permission from Engineer before using powder-actuated anchors.
- B. Do not drill or cut structural members.
- C. Inserts:
 1. Install inserts for placement in concrete forms.
 2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 in and larger.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above, flush with top of, or recessed into and grouted flush with slab as appropriate to location. Coordinate with Engineer before selecting method.
- D. Pipe Hangers and Supports:
1. Comply MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
 2. Install according to: ASME B31.1, ASME B31.5, ASME 31.9, or MSS SP 58.
 3. Support horizontal piping as indicated on Drawings or as indicated on Shop Drawings.
 4. Install hangers with minimum 1/2 in space between finished covering and adjacent Work.
 5. Place hangers within 12 in of each horizontal elbow.
 6. Use hangers with 1-1/2 in minimum vertical adjustment.
 7. Support horizontal cast iron pipe adjacent to each hub, with 5 ft maximum spacing between hangers.
 8. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
 9. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
 10. Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
 11. Support riser piping independently of connected horizontal piping.
 12. Provide copper-plated hangers and supports for copper piping.
 13. Design hangers for pipe movement without disengagement of supported pipe.
 14. Support piping independently so that equipment is not stressed by piping weight or expansion in piping system.
 15. Provide welded steel brackets where piping is to be run adjacent to building walls or columns.
 16. Use beam clamps where piping is to be suspended from building steel.
 17. Insulated Piping: Provide two bolted clamps designed to accommodate insulated piping.
 18. Use offset clamps where pipes are indicated as offset from wall surfaces.
 19. Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed are not exceeded
 20. Fastener System Installation:
 - a. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturers operating manual
 - b. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Insulation:
1. Provide clearance in hangers and from structure and other equipment for installation of insulation.
 2. Conform to Section 22 07 19 - Plumbing Insulation.
- F. Equipment Bases and Supports:
1. Provide housekeeping pads of concrete as detailed on Drawings that are a minimum 4 in thick and extend 6 in beyond supported equipment. Comply with Section 03 30 00 - Cast-in-Place Concrete.

2. Using templates furnished with equipment, install anchor bolts and accessories for mounting and anchoring equipment.
3. Construct supports of steel members, formed steel channel, or steel pipe and fittings. Brace and fasten with flanges bolted to structure.
4. Provide rigid anchors for pipes after vibration isolation components are installed.

G. Prime Coat:

1. Prime coat exposed steel hangers and supports.
2. Conform to Section 09 90 00 - Painting and Coating.
3. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.3 ATTACHMENTS

A. Pipe Hanger Spacing:

1. Pipe Material: ABS.
 - a. Maximum Hanger Spacing: 4 feet
 - b. 3/8 inch (9 mm).
2. Pipe Material: Aluminum.
 - a. Maximum Hanger Spacing: 10 feet (3.0 m).
 - b. Hanger Rod Diameter: 1/2 inch (13 mm).
3. Pipe Material: Cast iron.
 - a. Maximum Hanger Spacing: 5 feet (1.5 m).
 - b. Hanger Rod Diameter: 5/8 inch (15 mm). (15 mm).
4. Pipe Material: CPVC.
 - a. Size: 1 inch (25 mm) and smaller.
 - b. Maximum Hanger Spacing: 3 feet (0.9 m).
 - c. Hanger Rod Diameter: 1/2 inch (13 mm).
5. Pipe Material: CPVC.
 - a. Size: 1-1/4 inches (32 mm) and larger.
 - b. Maximum Hanger Spacing: 4 feet (1.2 m).
 - c. Hanger Rod Diameter: 1/2 inch (13 mm).
6. Pipe Material: Copper tube.
 - a. Size: 1-1/4 inches (32 mm) and smaller.
 - b. Maximum Hanger Spacing: 6 feet (1.8 m).
 - c. Hanger Rod Diameter: 1/2 inch (13 mm).
7. Pipe Material: Copper tube.
 - a. Size: 1-1/2 inches (39 mm) and larger.
 - b. Maximum Hanger Spacing: 10 feet (3.0 m).
 - c. Hanger Rod Diameter: 1/2 inch (13 mm).
8. Pipe Material: Fiberglass:
 - a. Maximum Hanger Spacing: 4 feet (1.2 m).
 - b. Hanger Rod Diameter: 1/2 inch (13 mm). (13 mm).
9. Pipe Material: Polybutylene.
 - a. Maximum Hanger Spacing: 2.7 feet (0.8 m).
 - b. Hanger Rod Diameter: 3/8 inch (9 mm).
10. Pipe Material: Polypropylene.
 - a. Maximum Hanger Spacing: 4 feet (1.2 m).
 - b. Hanger Rod Diameter: 3/8 inch (9 mm).
11. Pipe Material: PVC.

- a. Maximum Hanger Spacing: 4 feet (1.2 m).
- b. Hanger Rod Diameter: 3/8 inch (9 mm).
- 12. Pipe Material: Steel.
 - a. Size: 3 inches (75 mm) and smaller.
 - b. Maximum Hanger Spacing: 12 feet (3.7 m).
 - c. Hanger Rod Diameter: 1/2 inch (13 mm).
- 13. Pipe Material: Steel.
 - a. Size: 4 inches (100 mm) and larger.
 - b. Maximum Hanger Spacing: 12 feet (3.7 m).
 - c. Hanger Rod Diameter: 5/8 inch (15 mm).

3.4 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: place grout under supports for equipment and make smooth bearing surface
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.5 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field wiring: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds and methods used in correcting welding work, and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals
 - 2. Obtain fusion without undercut or overlap
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.6 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm)

END OF SECTION 40 05 07

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SECTION 40 05 51 – COMMON REQUIREMENTS FOR PROCESS VALVES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Valves.
 - 2. Valve actuators.

1.2 REFERENCE STANDARDS

- A. American Water Works Association:
 - 1. AWWA C542 - Electric Motor Actuators for Valves and Slide Gates.
 - 2. AWWA C550 - Protective Interior Coatings for Valves and Hydrants.
- B. ASTM International:
 - 1. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
 - 2. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
- C. Manufacturers Standardization Society:
 - 1. MSS SP-25 - Standard Marking System for Valves, Fittings, Flanges, and Unions.
- D. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. NFPA:
 - 1. NFPA 70 - National Electrical Code (NEC).
- F. NSF International:
 - 1. NSF 61 - Drinking Water System Components - Health Effects.
 - 2. NSF 372 - Drinking Water System Components - Lead Content.
- G. UL:
 - 1. Equipment Directory.

1.3 COORDINATION

- A. Section 013000 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with piping, equipment, and appurtenances.

1.4 PREINSTALLATION MEETINGS

- A. Section 013000 - Administrative Requirements: Requirements for preinstallation meeting.

1.5 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
 - 1. Submit manufacturer information for actuator with model number and size indicated.
 - 2. Submit valve cavitation limits.
- C. Shop Drawings: Indicate parts list, materials, sizes, position indicators, limit switches, control system, actuator mounting, wiring diagrams, and control system schematics.
- D. Valve-Labeling Schedule: Indicate valve locations and nametag text.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Certification of Valves Larger Than 12 Inches: Furnish certified copies of hydrostatic factory tests, indicating compliance with applicable standards.
- G. Delegated Design Submittals: Submit signed and sealed Shop Drawings with design calculations and assumptions for sizing of control valves.
- H. Manufacturer Instructions: Submit installation instructions and special requirements.
- I. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- J. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections, including factory-applied coatings.
- K. Manufacturer Reports: Certify that equipment has been installed according to manufacturer instructions.
- L. Qualifications Statement:
 - 1. Submit qualifications for manufacturer and licensed professional.

1.6 CLOSEOUT SUBMITTALS

- A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of valves and actuators.

1.7 QUALITY ASSURANCE

- A. Maintain clearances as indicated on Drawings.
- B. Ensure that materials of construction of wetted parts are compatible with process liquid.
- C. Materials in Contact with Potable Water: Certified to NSF 61 and NSF 372.
- D. Perform Work according to AWWA standards.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.
- B. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in State of New York.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Protect valve ends from entry of foreign materials by providing temporary covers and plugs.
 - 3. Provide additional protection according to manufacturer instructions.

1.10 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

1.11 WARRANTY

- A. Section 017000 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish five-year manufacturer's warranty for valves and actuators.

PART 2 - PRODUCTS

2.1 VALVES

- A. Description: Valves, operator, actuator, handwheel, chainwheel, extension stem, floor stand, worm and gear operator, operating nut, chain, wrench, and other accessories as required.
- B. Valve Ends: Compatible with adjacent piping system.
- C. Operation:
 - 1. Open by turning counterclockwise; close by turning clockwise.

2. Cast directional arrow on valve or actuator with OPEN and CLOSE cast on valve in appropriate location.
- D. Valve Marking and Labeling:
 1. Marking: Comply with MSS SP-25.
 2. Provide buried valves with valve boxes, covers, and extensions as specified in Valve Sections.
- E. Valve Construction:
 1. Bodies: Rated for maximum temperature and pressure to which valve will be subjected as specified in valve Sections.
 2. Bonnets:
 - a. Clamped, screwed, or flanged to body and of same material and pressure rating as body.
 - b. Furnish glands, packing nuts, or yokes as specified in valve Sections.
 3. Stems and Stem Guides:
 - a. Materials and Seals: As specified in valve Sections.
 - b. Bronze Valve Stems: According to ASTM B62 and B584.
 - c. Space stem guides 10 feet o.c.
 - d. Submerged Stem Guides: Type 304 stainless steel.
 4. Nuts and Bolts: As specified in Section 055000 - Metal Fabrications.

2.2 VALVE ACTUATORS

- A. Provide actuators with position indicators for shutoff valves as shown on plans or specified in other sections.
- B. Comply with AWWA C542.
- C. Provide chain actuators for shutoff valves mounted 8 feet above operating floor level as shown on plans or specified in other sections.
- D. Provide gear and power actuators with position indicators.
- E. Gear-Assisted Manual Actuators:
 1. Provide totally enclosed gears.
 2. Maximum Operating Force: 60 lbf.
 3. Bearings: Permanently lubricated bronze.
 4. Packing: Accessible for adjustment without requiring removal of actuator from valve.
- F. Chain Actuator:
 1. Description: Chain guides and hot-dip galvanized operating chain extending to 5-1/2 feet above operating floor level.
 2. Chain Wheels: Sprocket-rim type.
 3. Furnish chain storage if chains may interfere with pedestrian traffic.
- G. Valve Actuators in NEC Class I, Group D, Division 1 or 2 Hazardous Locations: UL approved.

- H. Accessories:
 - 1. Handwheel:
 - a. Furnish permanently attached handwheel for emergency manual operation.
 - b. Rotation: None during powered operation.
 - c. Permanently affix directional arrow and cast open and or closed on handwheel to indicate appropriate direction to turn handwheel.
 - d. Maximum Operating Force: 60 lbf.

2.3 INSULATION

- A. As specified in Section 404213 - Process Piping Insulation.
- B. As indicated on Drawings.

2.4 FINISHES

- A. Valve Lining and Coating: Comply with AWWA C550.
- B. Exposed Valves: As specified in Section 099000 - Painting and Coating.
- C. Do not coat flange faces of valves unless otherwise specified.

2.5 SOURCE QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. Testing: Test valves according to manufacturer's standard testing protocol, including hydrostatic, seal, and performance testing.
- C. Certificate of Compliance:
 - 1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
 - 2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 013000 - Administrative Requirements: Requirements for installation examination.
- B. Verify that piping system is ready for valve installation.

3.2 INSTALLATION

- A. Install valves, actuators, extensions, valve boxes, and accessories according to manufacturer instructions.
- B. Firmly support valves to avoid undue stresses on piping.
- C. Coat studs, bolts and nuts with anti-seizing lubricant.
- D. Clean field welds of slag and splatter to provide a smooth surface.
- E. Install valves with stems upright or horizontal, not inverted.
- F. Install brass male adapters on each side of valves in copper-piped system and solder adapters to pipe.
- G. Install 3/4-inch gate or ball valves with cap for drains at main shutoff valves, low points of piping, bases of vertical risers, and equipment.
- H. Install valves with clearance for installation of insulation and to allow access.
- I. Provide access where valves and fittings are not accessible.
- J. Comply with Division 40 - Process Interconnections for piping materials applying to various system types.
- K. Install insulation as indicated on Drawings and specified in other specifications.
- L. Valve Applications:
 - 1. Install shutoff and drain valves at locations as indicated on Drawings and as specified in this Section.
 - 2. Install shutoff and isolation valves.
 - 3. Isolate equipment, part of systems, or vertical risers as indicated on Drawings.
 - 4. Install valves for throttling, bypass, or manual flow control services as indicated on Drawings.
 - 5. Install ball, butterfly, and gate valves in water systems for shutoff service.
 - 6. Install ball, and gate valves in sanitary systems for shutoff service.

3.3 FIELD QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.
- B. Valve Field Testing:
 - 1. Test for proper alignment.
 - 2. If specified by valve Section, field test equipment to demonstrate operation without undue noise, vibration, or overheating.
 - 3. Architect/Engineer will witness field testing.

END OF SECTION 40 05 51

SECTION 40 05 53 – IDENTIFICATION FOR PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Nameplates.
 - 2. Tags.
 - 3. Pipe markers.
 - 4. Ceiling tacks.
 - 5. Labels.
 - 6. Lockout devices.
- B. Related Requirements:
 - 1. Section 09 90 00 - Painting and Coating: Execution requirements for painting specified by this Section.
 - 2. Section 40 05 13 - Common Work Results for Process Piping: Basic materials and methods for process piping systems.
 - 3. Section 40 05 23 - Common Work Results for Process Valves: Basic materials and methods or valves.

1.2 REFERENCE STANDARDS

- A. American Society of Mechanical Engineers:
 - 1. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.3 PREINSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Requirements for preinstallation meeting.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer's catalog literature for each product required.
- C. Shop Drawings: Submit list of wording, symbols, letter size, and color-coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for closeout procedures.
- B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance materials.
- B. Tools: Furnish special crimpers and other devices required for Owner to reinstall tags.

1.7 QUALITY ASSURANCE

- A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum one year experience.

PART 2 - PRODUCTS

2.1 NAMEPLATES

- A. Manufacturers:
 - 1. Brady ID
 - 2. Craftmark Pipe Marker
 - 3. Kolbi Pipe Marker Co.
 - 4. Marking Services, Inc.
 - 5. Pipemarket.com
 - 6. Seton Identification Products
 - 7. Substitutions: Specified in Section 01 60 00 - Product Requirements.
- B. Description: Laminated three-layer plastic with engraved black letters on light, contrasting background color.

2.2 TAGS

- A. Plastic Tags:
 - 1. Manufacturers:
 - a. Brady ID
 - b. Craftmark Pipe Marker
 - c. Kolbi Pipe Marker Co.

- d. Marking Services, Inc.
 - e. Pipemarker.com
 - f. Seton Identification Products
 - g. Substitutions: Specified in Section 01 60 00 - Product Requirements.
 - 2. Description:
 - a. Laminated three-layer plastic with engraved black letters on light, contrasting background color.
 - b. Minimum Tag Size and Configuration: 1-1/2 inches; diameter.
- B. Metal Tags:
 - 1. Manufacturers:
 - a. Brady ID
 - b. Craftmark Pipe Marker
 - c. Kolbi Pipe Marker Co.
 - d. Marking Services, Inc.
 - e. Pipemarker.com
 - f. Seton Identification Products
 - g. Substitutions: Specified in Section 01 60 00 - Product Requirements.
 - 2. Description:
 - a. Brass construction; stamped letters.
 - b. Minimum Tag Size and Configuration: 1-1/2 inches; diameter with finished edges.
- C. Information Tags:
 - 1. Manufacturers:
 - a. Brady ID
 - b. Craftmark Pipe Marker
 - c. Kolbi Pipe Marker Co.
 - d. Marking Services, Inc.
 - e. Pipemarker.com
 - f. Seton Identification Products
 - g. Substitutions: Specified in Section 01 60 00 - Product Requirements.
 - 2. Description:
 - a. Clear plastic with printed DANGER and message.
 - b. Minimum Tag Size: 3-1/4 by 5-5/8 inch.
 - c. Furnish grommet and self-locking nylon ties.
 - 3. Tag Chart: Typewritten, letter-size list of applied tags and location, in anodized aluminum frame.

2.3 PIPE MARKERS

- A. Color-Coding and Lettering Size: Conform to ASME A13.1.
- B. Plastic Pipe Markers:
 - 1. Manufacturers:
 - a. Brady ID
 - b. Craftmark Pipe Marker
 - c. Kolbi Pipe Marker Co.
 - d. Marking Services, Inc.

- e. Pipemarker.com
 - f. Seton Identification Products
 - g. Substitutions: Specified in Section 01 60 00 - Product Requirements.
 - 2. Description:
 - a. Factory-fabricated, flexible, semirigid plastic.
 - b. Preformed to fit around pipe or pipe covering.
 - c. Larger sizes may have maximum sheet size with spring fastener.
- C. Plastic Underground Pipe Markers:
 - 1. Manufacturers:
 - a. Brady ID
 - b. Craftmark Pipe Marker
 - c. Kolbi Pipe Marker Co.
 - d. Marking Services, Inc.
 - e. Pipemarker.com
 - f. Seton Identification Products
 - g. Substitutions: Specified in Section 01 60 00 - Product Requirements.
 - 2. Description:
 - a. Brightly colored, continuously printed plastic ribbon tape.
 - b. Minimum 6 inches wide by 4 mil thick.
 - c. Manufactured for direct burial service.

2.4 CEILING TACKS

- A. Manufacturers:
 - 1. Brady ID
 - 2. Craftmark Pipe Marker
 - 3. Kolbi Pipe Marker Co.
 - 4. Marking Services, Inc.
 - 5. Pipemarker.com
 - 6. Seton Identification Products
 - 7. Substitutions: Specified in Section 01 60 00 - Product Requirements.
- B. Description:
 - 1. Steel construction.
 - 2. Head: 3/4-inch diameter; color coded.
- C. Color-Coding and Lettering Size: Conform to ASME A13.1.

2.5 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Material and thickness: Multilayer, multicolor, plastic labels for mechanical engraving 1/16 inch thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: White
 - 3. Background: Blue
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg. F

5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch
 6. Minimum letter size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches
 7. Fasteners: Stainless-steel rivets or self-tapping screws
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is needed.

2.6 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe labels: Precoiled, semi rigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-adhesive Pipe labels: Printed Plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 1. Flow-Direction arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 2. Lettering size: At least 1-1/2 inches high

2.7 LOCKOUT DEVICES

- A. Lockout Hasps:
 1. Manufacturers:
 - a. Brady ID.
 - b. Master Lock Company, LLC
 - c. Substitutions: Specified in Section 01 60 00 - Product Requirements.
 2. Description:
 - a. Reinforced nylon construction.
 - b. Furnish hasp with erasable label surface.
 - c. Minimum Size: 7-1/4 by 3 inches.
- B. Valve Lockout Devices:
 1. Manufacturers:
 - a. Brady ID.
 - b. Master Lock Company
 - c. Substitutions: Specified in Section 01 60 00 - Product Requirements.
 2. Description:
 - a. Nylon construction.
 - b. Furnish device preventing access to valve operator and accepting lock shackle.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Degrease and clean surfaces of any substances that could impair bond of identification materials.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceiling in finished spaces, machine rooms, accessible maintenance spaces such as shafts, tunnels, and plenums, and exterior exposed locations as follows:
 - 1. Near each valve and control device
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures
 - 4. Near major equipment items and other points of origination and termination
 - 5. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
- B. Tags:
 - 1. Install tags using corrosion-resistant chain.
 - 2. Number tags consecutively by location.
- C. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe or as outlined on typical pipe details.
- D. Identify valves in main and branch piping with tags.
- E. Piping:
 - 1. Identify piping, concealed or exposed, with plastic pipe markers.
 - 2. Use tags on piping 3/4-inch diameter and smaller.
 - 3. Identify service, flow direction, and pressure.
 - 4. Install in clear view and align with axis of piping.
 - 5. Locate identification not to exceed 20 feet on straight runs, including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- F. Ceiling Tacks:

1. Provide ceiling tacks to locate valves above T-bar-type panel ceilings.
2. Locate in corner of ceiling panel closest to equipment.

END OF SECTION 40 05 53

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SECTION 40 23 40 – PROCESS PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes mechanical process piping and associated items as specified under this section and as shown on the drawings, unless otherwise noted. Process piping includes, but is not limited to, wastewater, sludge, large water services, blower air piping, chemical piping, and effluent water piping.
- B. This section also includes process piping insulation (both interior and exterior). Process piping shall be insulated as noted on the drawings. All process piping shall be coated per specifications whether the piping is to be insulated or not.
- C. All manufacturers shall have available to the Engineer, Contractor and the Owner, the services of a competent pipe installation specialist for assistance during construction of this project.
- D. The Contractor shall provide all necessary adapters and restraints required for the connection of pipe of various types, fittings, and valves. There shall be no extra payment for restraints, and/or adapters necessary for installation./
- E. The Contractor shall refer to other specification sections for testing of piping systems.
- F. All materials provided shall be new, un-used, and in acceptable condition. All piping shall be free from any defects and truly circular in section with concentric inner and outer surfaces.

1.2 REFERENCE STANDARDS

- A. American Society of Mechanical Engineers:
 - 1. ASME B31.3 - Process Piping Design.
- B. ASTM International:
 - 1. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings. ASTM A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Section 017000 - Execution and Closeout Requirements: Requirements for maintenance materials.
- B. Spare Parts:
 - 1. Furnish one set of manufacturer's recommended spare parts.
- C. Tools: Furnish special wrenches and other devices required for Owner to maintain completed installation.

PART 2 - PRODUCTS

2.1 DUCTILE IRON (DI) PIPE/FITTINGS

- A. Pipe shall be ductile iron, minimum class 53, and shall have flanged joints, unless otherwise noted.
- B. Pipe shall conform to the requirements of ANSI/AWWA, C115/A21.15. Flanges shall conform to Class 125, ANSI B16.1.
- C. Fittings shall have flanged joints unless otherwise noted. Fittings shall be ductile iron and conform to the requirements of ANSI/AWWA C110/A21.1.
- D. Push-on or mechanical joint fittings shall be provided where shown. Push-on or mechanical joint pipe shall be a minimum Class 51 and shall be provided in accordance with ANSI/AWWA C151/A21.51. Mechanical joint fittings shall be provided in accordance with ANSI/AWWA C111/A21.11
- E. Pipe and fittings shall have interior cement mortar lining. Below grade or underslab piping shall have an exterior asphaltic seal coating in accordance with ANSI/AWWA C104/A21.4. Above grade/slab piping shall be provided with an exterior primer coating compatible with coatings noted elsewhere (TNEMEC Series 1, Omnithane, or equal).
- F. All Hardware shall be cold-formed, high strength, low-alloy steel, ASTM A242.

2.2 RESTRAINERS FOR DI PIPE

- A. Restraining glands shall be provided on all mechanical joint fittings and valves. Restraining glands shall be as manufactured by Mega-lug or equal.
- B. Restraining glands for PVC piping shall be specifically designed for use on PVC pipe.

2.3 PVC & CPVC SCH 40/80 PIPE.FITTINGS

- A. All PVC and CPVC Schedule 40/80 pipe shall be manufactured from a Type I, Grade I Polyvinyl Chloride compound with a cell classification of 12454 (23477 for CVPC) per ASTM D1784 and ASTM D 2665 (ASTM F 437/439 for CPVC).
- B. The pipe shall be manufactured in strict compliance with ASTM D1785, consistently meeting or exceeding the quality assurance test requirements of this standard with regard to material, workmanship, burst pressure, flattening and extrusion quality.
- C. All pipe shall be shipped, stored and installed in accordance with industry standards.
- D. Shall be solvent welded pipe and fittings.
- E. Plastic piping for chemical applications (i.e. Sodium Hypochlorite, Citric Acid, Ferric Chloride, etc.) shall be CPVC pipe and fittings suitable for the chemical application noted. Sodium Hypochlorite resistant cement shall be used in Sodium Hypochlorite Applications.

2.4 STAINLESS STEEL PIPE/FITTINGS

- A. All stainless steel pipe and fittings shall be welded and of a minimum schedule as shown on the drawings.
- B. Pipe shall be fabricated and installed, at a minimum, in conformance with ANSI/AWWA C220 – 98 requirements.
- C. Pipe shall be clean and free from contaminating iron particles. Contamination shall be removed by pickling and passivation in accordance with ASTM A380.
- D. All pipe and fittings shall be of a minimum grade of 304 or 316 as noted on the drawings. Minimum Schedule 10 unless otherwise noted.
- E. All stainless steel piping, fittings, and welds shall be factory passivated. Care shall be taken by installers not to contaminate the surfaces of the stainless steel materials. Welds and contaminated areas shall be field passivated to provide a clean, corrosion resistant surface.

2.5 POLYVINYL CHLORIDE (P.V.C.) PIPE/FITTINGS

- A. Pipe shall have bell and spigot joints with flexible elastomeric gaskets, integral bells and locked in place rubber rings.
- B. DR-18 or DR-25 PVC pipe shall be polyvinyl chloride pipe conforming to the requirements of AWWA C-900, or AWWA C-905 Class 150. Fittings shall be mechanical joint, ductile iron conforming to ANSI/AWWA C153/A21.53 and ANSI/AWWA C111/A21.11.
- C. SDR-35, PVC pipe and fittings shall be polyvinyl chloride conforming to the requirements of ASTM, D-3034 or ASTM, F679, Type PSM. Pipe and fittings shall be fabricated from an approved class 12364-C compound conforming to ASTM D1784. Joints shall conform to ASTM, D3212 and F477 standards.
- D. All hardware used on piping, pipe fittings and appurtenances shall be made of cold formed high strength, low-alloy steel (COR-TEN), ASTM A242.
- E. Restrainers for PVC pipe shall be high strength ductile iron with a full 360 degree support serrated clamping ring, specifically designed for PVC.

2.6 PE PIPE, TUBE, AND FITTINGS

- A. PE Pipe and Fittings:
 - 1. Pipe:
 - a. Comply with PE4710.
 - b. DR: 17
 - 2. Fittings:
 - a. Type: Molded.
 - b. Butt fusion
 - 3. Joints: Butt fusion, Threaded union as applicable.

- B. PE Tube and Fittings:
 - 1. Tube:
 - a. Comply with AWWA C901.
 - b. Size and Wall Thickness:
 - 1) 3/8" OD, 1/4" ID
 - c. Pressure Rating: 300 psi
 - 2. Fittings:
 - a. Butt Fusion.
 - b. Materials: Suitable for application.
 - 3. Threads:
 - a. Type: Straight.
 - b. Comply with ASME B1.1.

2.7 WELDED CARBON STEEL PIPE/FITTINGS

- A. All welded steel pipe and fittings shall be minimum schedule 40 or otherwise shown on the drawings.
- B. Pipe/fittings shall conform to ASME/ANSI B16.9 and ASTM A-234. Flange adapters for welded piping shall conform to ASTM A105 and ANSI B16.5
- C. Pipe shall be clean and free from contaminating particles.
- D. Shall meet standard pressure ratings based on ASME/ANSI B31 Code for Pressure Piping.
- E. Shall conform to ANSI B36.10.

2.8 EXPANSION JOINT FITTINGS

- A. Shall have ANSI 125/150 flanged connections. Shall be suitable for min. operating pressure of 125 psi. A 4:1 safety factor shall be applied for burst to rated pressure.
- B. Reinforced BUNA-N elastomer material, galvanized steel control rods, galvanized steel retaining rings, single arch.
- C. Shortest length of expansion joint fitting shall be provided.
- D. Manufacturer shall have at least five (5) years' experience in manufacture of non-metallic expansion joints. Expansion joint may be RC Series by Proco, USLRC series by Flexicraft.
- E. All expansion joints shall be provided with minimum two (2) control rods w/ sleeves, unless otherwise noted. Control rods shall be provided by the valve manufacturer and be restrained in accordance with manufacturer recommendations.
- F. Expansion joints for chemical system piping applications shall be of Hypalon material, unless otherwise noted. Shall be slip-on, single arch, with stainless steel bands. Shall be SL-50 series by Red Valve Company, or equal.

2.9 INSULATED PIPING

- A. Polyisocyanurate Piping Insulation: shaped for piping application, complying with ASTM C591, Grade 2, Type I. Minimum density 1.8 lb/cf, 25.0 psi compressive strength, maximum permeability 4.0 perms-in. R-value shall be 5.3/in minimum. Provide Trymer 1800 polyisocyanurate insulation, or equal.
- B. Vapor Barrier: flexible polyvinylidene chloride (PVDC) jacketing material, 4 mil min. thickness, Maximum permeability 0.02 perms in accordance with ASTM E96. Provide Saran 540 CX Vapor Retarder Film, or equal. Vapor barrier tape shall be flexible polyvinylidene (PVDC) coated with an acrylic adhesive. Tape permeability shall be maximum 0.03 perm. Provide Saran 520 CX Vapor Retarder Tape, or equal.
- C. Seal all ends and seams with mastic. Childers CP-10, or equal.
- D. Provide 0.016" minimum stucco embossed aluminum jacketing with 1/2" min. stainless steel banding.
- E. Insulate all piping and fittings. Insulation, vapor barrier, and jacketing shall conform to fittings, valves, and other special piping shapes.
- F. Provide 1-1/2" minimum thickness unless otherwise noted on plans.

2.10 TEMPORARY PIPING

- A. The contractor shall be responsible for temporary piping throughout the project as noted on the plans, in the specifications, and as necessary to complete the contract work. Temporary piping may include air piping, compressor piping, water/wastewater piping, sludge/scum piping, etc. Temporary piping provided shall be of suitable material and integrity to meet the needs of the system being temporary piped up without leakage or failure.
- B. Temporary piping may be PVC piping, carbon steel piping, or ductile iron piping as suitable for the application. Flexible hosing may be utilized in certain cases so long as the flexible hosing is in good condition (free from defects or signs of extensive wear) and that the hosing is of suitable material and pressure rating for the application.
- C. Temporary piping shall be min. 50 psi pressure rating or higher as applicable except for gravity piping.
- D. Suction and discharge piping shall be run as short as possible and in accordance with the owner/engineer as not to interfere with other operations in the vicinity.
- E. Shall be sized for maximum velocity of 10 feet/sec and maximum headloss of 20 psi.
- F. Any temporary piping showing signs of leakage or failure shall be replaced by the contractor as soon as possible and shall be the sole responsibility of the contractor. All temporary piping shall be completely removed from the site upon completion of its intended use.
- G. Contractor shall uninstall all temporary piping upon completion of the project unless otherwise approved by Engineer.

PART 3 - EXECUTION

3.1 GENERAL

- A. Wet Well Piping: All piping used in the wet well and all piping removable with the pumps shall be epoxy lined ductile iron.
- B. Valve Vault Piping: All piping used in valve vaults shall be corrosion resistant epoxy lined ductile iron. Piping shall have steel pipe supports.
- C. Force Main Piping: All new force main piping shall be corrosion resistant epoxy lined ductile iron pipe.
- D. Piping systems shall be installed as indicated on the drawings. The exact locations of pipe valves and other appurtenances shown or specified may be relocated only at the approval of the Engineer.
- E. Pipe and fittings shall be handled in such a manner that the coating and lining are not damaged during their delivery, storage or installation. Pipe with damaged coatings or linings shall be repaired or replaced by the Contractor at his expense to the satisfaction of the Engineer.
- F. All pipe shall be of good quality and free from any defects which would make it unfit for the use intended. All pipe shall be a true circle in section with concentric inner and outer surfaces.
- G. For work at existing facilities: The Owner shall be notified a minimum of five (5) days prior to the work to begin. The Contractor shall coordinate with the Owner's Representative for any necessary change in operating conditions (e.g. open/closing valves, etc.) with a minimum of two (2) days advance notice. The Contractor shall, at no time, operate or alter any aspect of operations of any existing facilities.

3.2 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

3.3 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Protect equipment from intrusion of water and other materials, and from damage.
- C. Repair damaged coatings with material equal to the original coating.
- D. Repair damaged galvanized piping according to ASTM A780.

3.4 INSTALLATION

- A. Install piping and appurtenances as indicated on Drawings using minimum number of joints, and according to manufacturer's instructions and ASME B31.3.
- B. In locations where pipe expansion joints are indicated, install pipe alignment guides adjacent to and within four pipe diameters of joint.
- C. Field Fabrication: Fabricate fittings according to manufacturer's instructions.
- D. Provide thrust restraints as required. All piping and fittings shall be solidly braced as necessary to prevent any deflection due to thrust pressure. Bracing shall be accomplished with the use of cast-in-place concrete pipe supports steel bracing, or other pipe supports as shown on the drawings or approved by the Engineer.
- E. The Contractor shall repair any damage to existing utilities, materials, or equipment already installed, caused during the installation of piping systems at his expense per the Owner of the damaged items.
- F. Provide flexible couplings and expansion joints at connections to equipment, and where indicated on Drawings.
- G. Install couplings, service saddles, and anchors according to manufacturer's instructions.
- H. Provide upstream and downstream clearances as indicated on Drawings and according to component manufacturer's recommendations.
- I. Local Indicators:
 - 1. Install direct-reading indicator devices such as thermometers and pressure gauges, to be read from floor level and accessible for maintenance and service.
 - 2. Install according to manufacturer's instructions.

3.5 ADJUSTING

- A. Section 017000 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Field calibrate local indicators at time of piping installation.

END OF SECTION 40 23 40

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SECTION 40 50 00 - SOLENOID CONTROL VALVES

PART 1 - GENERAL

1. Standard products - use the same manufacturer for multiple units of same type.
2. "Tying" of equipment into packages for the purpose of thwarting competition shall be considered to be in non-compliance with these specifications.
3. Manufacturers shall price items under different subsections or sections separately.

PART 2 - PRODUCTS

2.1 SOLENOID CONTROL VALVES

A. FUNCTION

The solenoid control valve shall be a self-contained hydraulically operated, diaphragm-operated valve that includes a diaphragm-operated high capacity auxiliary valve and a packless three-way solenoid pilot valve. In response to an electrical signal, the solenoid control valve shall either open wide or close drip tight. The three-way solenoid pilot alternately applies pressure to or exhausts pressure from the diaphragm chamber of the high capacity auxiliary which in turn causes the main valve to open or close.

B. MATERIALS

1. Material Specification for the Solenoid Control Valves Main Valve as follows:

<u>Component</u>	<u>Material</u>
Body & Cover	Ductile Iron-ASTM A536 (standard)
Main Valve Trim	Stainless Steel
Seat	Stainless Steel
Stem, Nut and Spring	Stainless Steel
Seal Disc	Buna-N® Rubber
Diaphragm	Nylon Reinforced Buna-N® Rubber
Internal Trim Parts	Stainless Steel; Bronze; Brass
End Detail	Flanged (4"-36")
Pressure Rating	Class 150 lb. (250psi Max.)
Temperature Range	Water to 180°F
Any other wetted metallic parts	Stainless Steel; Bronze; Brass
Coating (optional)	Fusion Bonded Epoxy Coating (Interior and Exterior); ANSI / NSF 61 Approved / AWWA coating specifications C116-03.
Accessories	X101 Position Indicator, Closing Speed Control, Isolation Valves

C. MANUFACTURE

1. Main Valve:

- a. The main valve shall be hydraulically operated, single diaphragm actuated, globe or angle pattern. The valve shall consist of three major components; the body with seat installed, the cover with bearing installed and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating the operating pressure from line pressure. Packing glands, stuffing boxes and/or rolling diaphragm technology will not be permitted and there shall be no pistons operating the main valve or pilot controls. No fabrication or welding shall be used in the manufacturing process. Y-pattern valves shall not be permitted. Main valve shall comply with NSF/ANSI 61 and certified lead free to NSF/ANSI 372 as a safe drinking water system component.
2. End Connections:
 - a. End Connections for control valve shall be flanged per ASME/ANSI B16.42, Class 150.
3. Main Valve Body:
 - a. No separate chamber(s) below the diaphragm shall be allowed between the main valve cover and body. No fabrication or welding shall be used in the manufacturing process.
 - b. The valve shall contain a resilient, synthetic rubber disc with a rectangular cross-section contained on three and one half sides by a disc retainer and forming a tight seal against a single removable seat insert. No O-ring type discs (circular, square, or quad type) shall be permitted as the seating surface. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the discs firmly in place. The disc retainer shall be of a sturdy one-piece design capable of withstanding opening and closing shocks. It must have straight edge sides and a radius at the top edge to prevent excessive diaphragm wear as the diaphragm flexes across this surface. No hours-glass shaped disc retainers shall be permitted and no V-type or slotted-type disc guides shall be used.
 - c. The diaphragm assembly containing a non-magnetic stainless steel stem; of sufficient diameter to withstand high hydraulic pressures and shall be fully guided at both ends by a bearing in the main valve cover and an integral bearing in the valve seat. The valve seat shall be a solid, one-piece design and shall have a minimum five-degree taper on the seating surface for a positive, drip-tight shut off. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating the operating pressure from the line pressure. No bolts or cap screws shall be permitted for use in the construction of the diaphragm assembly
 - d. The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm's center hole for the main valve stem must be sealed by the vulcanized process or a rubber grommet sealing the center stem hole from the operating pressure. The diaphragm must withstand a Mullins Burst Test of a minimum of 600 X per layer of nylon fabric and shall be cycled tested 100,000 times to insure longevity. The diaphragm shall not be used as the seating surface. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully opened or fully closed position.
 - e. The main valve seat and stem bearing in the valve cover shall be removable. The cover bearing and seat in the 6" and smaller size valve shall be threaded into the cover and body. The valve

seat in the 8" and larger size valves shall be retained by flat head machine screws for ease of maintenance. The lower bearing of the valve stem shall be contained concentrically within the seat and shall be exposed to the flow on all sides to avoid deposits. To insure proper alignment of the valve stem, the valve body and cover shall be machined with a locating lip. No "pinned" covers to the valve body shall be permitted. Cover bearing, disc guide and seat shall be made of the same material. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the pipeline. The valve shall be designed such that both the cover assembly and internal diaphragm assembly can be disassembled and lifted vertically straight up from the top of a narrow opening/vault. Y-pattern valves shall not be permitted. The seat shall be of the solid one piece design. Two piece seats or seat inserts shall not be permitted. Packing glands and/or stuffing boxes shall not be permitted.

4. Pilot Control System:

- a. The pilot control shall be a direct acting three-way poppet solenoid valve controlled by an external electrical power source. The pilot system shall include strainers, shut-off cocks and manual operator. The pilot control system shall utilize copper control tubing and brass fittings. The pilot system shall include opening and closing speed control needle valves utilized to prevent surging of the system on start-up and shut-down. Solenoid shall have a NEMA IV enclosure.

5. Material Specification for Pilot Control:

<u>Component</u>	<u>Material</u>
Body	Brass B283 (standard)
Pilot Trim	Brass & 303 Stainless Steel
Seals and Disc	NBR
Core and Plug nut	430F Stainless Steel
Core Springs	302 Stainless Steel
Shading Coil	Copper
Disc-Holder	CA
Core Guide	CA
Connections	FNPT
Pressure rating	400 psi Max.
Temperature Range	AC: Water to 125°F Max. DC: Water to 104°F Max.
Power Supply	120VAC / 60 Hz (standard)
Enclosure	NEMA Type 1, General Purpose, Watertight (standard)
Control Tubing	Copper
Control Fittings	Brass

6. Factory Assembly:

- a. Each control valve shall be factory assembled.
- b. The Quality Management System of the factory shall be certified in accordance with ISO 9001: 2008.
- c. For all control valves, the factory assembly shall include the complete main valve, pilot valve(s), and all associated accessories and control equipment.

- d. During factory assembly the control valve manufacture shall make all necessary adjustments and correct any defects.
7. Nameplates:
 - a. Each Control Valve and associated pilot(s) shall be provided with an identifying nameplate.
 - b. Nameplates, depending on type and size of control valve, shall be mounted in the most practical position possible, typically on the inlet side of the valve body.
 - c. Nameplates shall be brass and a minimum of 3/32" thick, 3/4" high and 2-3/4" long.
 - d. Pertinent control valve data shall be etched or stamped into the nameplate. Data shall include control valve Catalog number, function, size, material, pressure rating, end-connection details, type of pilot controls used and control adjustment range.
8. Factory Testing:
 - a. Each control valve shall be factory tested.
 - b. Tests shall conform to approved test procedures.

D. PRODUCT DATA

1. The following information shall be provided:
 - a. Control Valve manufacturer's technical product data.
 - b. Control Valve manufacturer's Installation, Operation and Maintenance manual (IOM).
2. Provide specific information on all optional features specified above and confirm that these items are provided.
3. The valve manufacturer shall be able to supply a complete line of equipment from 1/2" through 6" sizes and a complete selection of complementary accessories and equipment.
4. The control valve manufacture shall provide a computerized cavitation analysis report which shows flow rate, differential pressure, and percentage of valve opening. Cv factor, system velocity, and if there will be cavitation damage. The manufacturer must also provide valve noise levels according to International Standards over the flow range of the valve. Noise calculation program will be specific to the control valve manufacturer, and based upon tests conducted by a third party, independent laboratory and will be able to provide dBA values for octave band frequencies between 31.5 and 8000 Hz. (Valves with KO trim calculations are per another industry accepted standard without the octave band frequency noise levels). Generic, third party noise calculation for non-specific control valves will not be accepted.

PART 3 - EXECUTION

A. DELIVERY, STORAGE AND HANDLING

SOLENOID CONTROL VALVES

1. Delivery

- a. The Manufacture shall deliver the control valves to:

*5119 W. Stan Schlueter Loop, Killeen, TX, 76549
Attention: Alexander Tucker: 254-290-0915 and Steve Kana: 254-338-2481
Call 48 hours prior to delivery.*

- b. Upon delivery, control valves to be unloaded and stored by the:

City of Killeen

2. Packing and Shipping

- a. Control valves specified herein shall be factory assembled. Any control valve appurtenances, accessories, parts and assemblies that are shipped unassembled shall be packaged and tagged in a manner that will protect the equipment from damage and facilitate the final assembly in the field.
- b. Care shall be taken in loading, transporting and unloading to protect control valves, appurtenances, or coatings from damage. Equipment shall not be dropped. All control valves and appurtenances shall be examined before installation and no piece shall be installed which is found to be defective. Any damage(s) shall be repaired.
- c. Prior to shipping, the control valves and all associated accessories shall be acceptably packaged and covered to prevent entry of foreign material.
- d. All packaged control valves shall be shipped, remain covered and stored on site until they are installed and put into use.

B. FIELD TESTING

1. A direct factory representative shall be made available by the equipment supplier for start-up service, inspection and necessary adjustments.

PART 4 – LINK2VALVES™ CONTROL VALVES SERVICE ASSET MANAGEMENT

A. GENERAL FUNCTION

A maintenance scheduling software package is to be provided with the control valves supplied. This software shall be available to be run on mobile devices, available on either Google or Apple app sites and will be synchronized with a custom website portal. The software will allow for picture taking, geo-locating, and detailed service records to be maintained and available both on a website and remotely on a hand-held device.

B. STORAGE

Hosting servers are to be secure and maintained in the valve supplier's own servers and facility, not a third-part location. The program is to be custom developed for automatic control valves by the control

valve manufacturer and must be able to prove a minimum of 30,000 valves in the database in order to be considered.

- C. Software is to be Link2Valves™ by Cla-Val Company.

The Control Valve manufacturer shall warrant the valve to be free of defects in material and workmanship for a period of three years from date of shipment provided the valve is installed and used in accordance with all applicable instructions. Electrical components shall have a one-year warranty.

The control valve shall be CLA-VAL Company Model No. 136-03, Solenoid Control Valve, as manufactured by Cla-Val Co., Newport Beach, CA 92659-0325.

END OF SECTION

SECTION 40 73 13 – PROCESS PIPING GAUGES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Section 40 05 19, Process Piping

1.2 SUMMARY

- A. This Section includes the following types of gages for Process Piping and Equipment:
 - 1. Pressure gages and fittings.
- B. Gages furnished as part of factory-fabricated equipment may be specified as part of equipment assemblies in other Divisions. Refer to those sections as applicable.
- C. Unless otherwise noted, pressure gages shall be provided on the suction and discharge piping of each control valve, pump, blower, and/or compressor provided. Exact location shall be as shown on the drawings or as located in the field and approved by the Engineer.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with conditions of Contract and Division 1 Specification Sections.
 - 1. Product data for each type of gage. Include scale range and ratings.

1.4 QUALITY ASSURANCE

- A. UL Compliance: Comply with applicable UL standards pertaining to gages.
- B. ASME and ISA Compliance: Comply with applicable portions of ASME and Instrument Society of America (ISA) standards pertaining to construction and installation of gages.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Pressure Gages:
 - a. Ametek, U.S. Gauge Div.

- b. Ashcroft Dresser Industries\Instrument Div.
 - c. Marsh Instrument Co., Unit of General Signal.
 - d. Marshalltown Instruments, Inc.
 - e. Trerice (H.O.) Co.
 - f. Weiss Instruments, Inc.
 - g. Weksler Instruments Corp.
 - h. WIKA Instruments Corp.
2. Pressure Gage Accessories: Same as for pressure gages.

2.2 PRESSURE GAGES

- A. Type: General use, ASME B40.1, Grade A, phosphor bronze bourdon-tube type, bottom connection.
- B. Case: Stainless steel, glass lens, 4 1/2 inches diameter.
- C. Connector: Brass, 1/4-inch NPS.
- D. Scale: White coated aluminum, with permanently etched markings.
- E. Accuracy: Plus or minus 1 percent of range span.
- F. Range: Conform to the following:
- G. All fluids: 2 times operating pressure.
- H. Pressure gauges on the suction side of pumps or blowers shall be compound style gauges indicating pressure and vacuum.
- I. Gauges provided for wastewater or sludge applications shall be furnished with a diaphragm seal constructed of stainless steel and a resilient diaphragm. The seal shall be designed specifically for a wastewater application. Gauges with a diaphragm seal shall be provided with isolation valves between the seal and the process piping and have a connection to the process piping of a minimum of 1 inch.

2.3 PRESSURE GAGE ACCESSORIES

- A. Syphon: 1/4-inch NPS straight coil constructed of brass tubing with threads on each end.
- B. Snubber: 1/4-inch NPS brass bushing with corrosion-resistant porous metal disc. Disc material shall be suitable for fluid served and rated pressure.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRESSURE GAGES

- A. Install pressure gages in piping tee with pressure gage isolation valve.

- B. Install in the locations, and as detailed on the plans, sections and schematics. Locate on pipe at most readable position.
- C. Pressure Gage Needle Valves: Install in piping tee with snubber.

3.2 ADJUSTING AND CLEANING

- A. Adjusting: Adjust faces of gages to proper angle for best visibility.
- B. Cleaning: Clean windows of gages and factory-finished surfaces. Replace cracked and broken windows, and repair scratched and marred surfaces with manufacturer's touch-up paint.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other sections. The drawings indicate the general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
 - 1. Install gages piping adjacent to control valve, equipment, or machine to allow servicing and maintainance of equipment.

END OF SECTION 40 73 13

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SECTION 43 41 20 - STANDPIPE WATER STORAGE TANK

PART 1 - GENERAL REQUIREMENTS

1.1 SCOPE

- A. The Contractor shall be responsible for all labor, materials and equipment necessary for the design, fabrication, construction, painting, disinfection and testing of an elevated, welded carbon steel water standpipe storage tank. Design and construction of the Standpipe Tank shall conform to all requirements of AWWA D100 Standard for Welded Carbon Steel Tanks for Water Storage, except as modified by the requirements of these contract documents.
- B. Qualification of Manufacturer
 - 1. The design and construction of the Standpipe water storage tank shall only be undertaken by a Contractor with a minimum of five years experience with tank construction. The Contractor must be able to demonstrate experience through the design and construction of at least five standpipe style water tanks. The Contractor shall not subcontract the design or erection of the steel tank.

1.2 SUBMITTALS

- A. No bid will be considered unless this information is provided with the proposal:
 - 1. A list of five Standpipe style elevated tanks constructed within the last five years, including the name of the Owner, tank capacity and the Consulting Engineer.
 - 2. Final tank fabrication drawings sealed and signed by a licensed professional engineer licensed in Texas.
 - 3. Final foundation design drawings sealed and signed by a licensed professional engineer licensed in Texas.

1.3 STANDARD SPECIFICATIONS

- A. All work on the water storage tank shall fully conform to the requirements of the latest published editions of the following Standard Specifications:
 - 1. AWWA (American Water Works Association) D100 Standard for Welded Carbon Steel Tanks for Water Storage.
 - 2. AWWA D102 - Standard for Painting Steel Water Storage Tanks
 - 3. AWWA C652 - Standard for Disinfection of Water Storage Facilities.
 - 4. AWS (American Welding Society) D1.1
 - 5. NSF (National Sanitation Foundation) 61 - Materials in contact with Potable Water.
 - 6. Steel Structures Painting Council Manual - Volume 1 - Good Painting Practice.
 - 7. Steel Structures Painting Council Manual - Volume 2 - Systems and Specifications.
 - 8. ACI 318 - Building Code Requirements for Reinforced Concrete
 - 9. ACI 301 - Specifications for Structural Concrete

1.4 TANK DETAILS

- A. The standpipe tank shall be all-welded construction of the most economical design. All members of structural steel or of reinforced concrete shall be designed to safely withstand the maximum stresses to which they may be subjected during erection and operation.
 - 1. The minimum operating capacity of the storage tank will be 100,000 US gallons.
 - 2. 15' Diameter x 80' Tall
 - 3. Reference Drawings for elevation and dimensions of storage tank.

1.5 PERMITS, EASEMENTS, ELECTRICAL LINES AND UTILITIES

- A. The site plans generally indicate the approximate location of all overhead or underground electrical lines and other utilities and piping. The Owner is responsible for relocating or de-energizing any electrical or utility lines that may interfere with the safe construction of the foundation or structure(s).

1.6 WORKING DRAWINGS

- A. After contract award and prior to construction, the Contractor shall provide engineering drawings and design calculations for the standpipe steel tank and the foundation. Drawings shall show the size and location of all structural components and the foundations along with reinforcement details, the required strength and grade of all materials and the size and arrangement of principle piping and equipment. The drawings and calculations shall bear the certification of a professional Engineer licensed in the State of Texas. The design coefficients and resultant loads for snow, wind and seismic forces, and the methods of analysis shall be documented.

PART 2 - DESIGN

2.1 GENERAL

- A. The structural design of the elevated storage tank shall conform to the following design standards except as modified or clarified as follows:
 - 1. Foundations – AWWA D100 and ACI 318 – Building Code Requirements for Reinforced Concrete.
 - 2. Steel Tank - AWWA D100
 - 3. Steel Tank Painting – AWWA D102.

2.2 ENVIRONMENTAL LOADS – AWWA D100 AND ASCE 7

- A. Wind Load – Wind pressure shall be determined in accordance with AWWA D100, Section 3.1.4. Basic wind speed used in the Wind Pressure formula shall be determined using the mapped site location and Figure 1 of AWWA D100. For tanks located in coastal regions, the Owner's Engineer shall consider the use of an increased basic wind speed as appropriate.
 - 1. Basic Wind Speed (BWS) = 90 MPH

- B. Seismic Load – Seismic loads shall be determined in accordance with AWWA D100, Section 13.
 - 1. Region Dependent Transition Period (T_L) = 12 (Fig. 19)
 - 2. Site Class D (Table 25) (Contractor shall reference Geotechnical Report)
 - 3. MCE Spectral Response Acceleration at 0.2sec (S_s) and 1sec (S_1) (Fig's. 5-18)
 - a. $S_s = 0.071$
 - b. $S_1 = 0.025$
 - c. Longitude = 97°48'18.82"W (at tank center)
 - d. Latitude = 31°5'30.84"N (at tank center)
 - 4. Importance Factor (I_E) = 1.5 (Table 24)
- C. Snow Load – Snow load shall be determined in accordance with AWWA D100, Section 3.1.3.1.
- D. Tank manufacturer shall be responsible for confirming environmental loads as described above.

2.3 LIVE LOADS

- A. Minimum roof live load = 15 psf. Not to be combined with snow loads.

2.4 FOUNDATION

- A. A Geotechnical investigation has been carried out at the site and a copy of the report is included with the Contract Documents. Recommendations for the foundation and allowable bearing capacities are defined in this report. The Owner shall retain the services of the Geotechnical consultant to verify the adequacy of the bearing stratum after the Contractor has carried out the excavation and before any concrete or reinforcement is placed. The concrete foundation shall be designed by the Contractor based upon the recommendations in the geotechnical report. The report must provide the allowable soil bearing pressure with appropriate factors of safety, the active and passive earth pressure coefficients, the angle of soils internal friction, its cohesion, unit weight and recommendations for bearing depth and backfill requirements.

2.5 STEEL TANK

- A. General
 - 1. The tank and supporting structure shall be of all-welded steel design and construction. All materials, design, fabrication, erection, welding, testing and inspection of the steel tank shall be in accordance with the applicable sections of AWWA D100 except as modified in this document. The tank shall have a cylindrical shape for capacity of 100,000 gallons.

2.6 MINIMUM PLATE THICKNESS

- A. The minimum thickness for any part of the structure shall be 3/16 inch for parts not in contact with water and 1/4 inch for parts in contact with water. At junctions in plates where meridional forces are discontinuous such as cone to cylinder junctions or cone to base plate junctions, a tension or compression ring may be required to resist radial forces generated by the discontinuous membrane forces. In these regions, allowable stresses shall not exceed the following stress:
 - 1. Tension ring stress shall not exceed the lesser of 15,000 PSI or one half of the minimum specified yield of the plate material.
 - 2. Compression ring stresses shall not exceed 15,000 PSI.
 - 3. The overturning moment used in designing the foundation shall include the moment due to eccentricity of the gravity loads caused by deflection of the structure under wind or seismic conditions (i.e. P-delta effect).

2.7 MIXING

- A. Tank shall have mechanical mixer as specified in Section 43 50 00. Contractor shall coordinate that mixer is correctly mounted and that future connections are installed for chloramine boosting should the Owner elect to provide that in future.

PART 3 - CONSTRUCTION

3.1 CONCRETE FOUNDATION

- A. The foundation shall be designed and constructed to safely and permanently support the structure. The basis of the foundation construction shall be consistent with the soils investigation data included herein at the end of these specifications. Appropriate changes to construction schedule and price will be negotiated if, during excavation, soil conditions are encountered which differ from those described in geotechnical report. The concrete foundation shall be constructed in accordance with ACI 301. Minimum concrete compressive strength shall be as specified in Section 03 30 00, "Cast-In-Place Concrete".

3.2 STEEL TANK CONSTRUCTION

- A. General
 - 1. The erection of the steel tank shall comply with the requirements of Section 10 of AWWA D100 except as modified by these documents.
- B. Welding
 - 1. All shop and field welding shall conform to AWS and AWWA D100, Section 10. The contractors shall ensure that the welders or welding operators are qualified in accordance with ASME Section IX or ANSI/AWS B2.1.
- C. Fabrication
 - 1. All fabrication and shop assembly shall conform to the requirements of AWWA D100, Section 9, Shop Fabrication.
- D. Erection

1. Plates subjected to stress by the weight or pressure of the contained liquid shall be assembled and welded in such a manner that the proper curvature of the plates in both directions is maintained. Plates shall be assembled and welded together by a procedure that will result in a minimum of distortion from weld shrinkage.
- E. Inspection and Testing
 1. Inspection of shop and field welds shall be in accordance with AWWA D100, Section 11, Inspection and Testing. All inspection shall be performed prior to interior and exterior field painting. Radiographic inspection shall be performed by an independent testing agency with all costs included in the Contractor's bid and paid by the Contractor.
- F. Roof Lap Joints
 1. All interior lap joints shall be sealed by means of caulking or continuous seal welding. This shall include penetrations of roof accessories.
- G. Painting and Disinfection
 1. Surface preparation and coating of all steel surfaces shall be in accordance with Section 09 90 00 "Coating System for Steel Water Storage Tanks".

3.3 ACCESSORIES

- A. General
 1. The following accessories shall be provided in accordance with these specifications. All items shall be in full conformity with the current applicable OSHA safety regulations and the operating requirements of the structure.
- B. Ladders
 1. Access ladders shall be provided at the following locations:
 - a. Grade to transition platform #1.
 - b. Transition platform #1 to transition platform #2.
 - c. Transition platform #2 to steel tank roof.
 - d. Ladder side rails shall be a minimum 3/8 inch by 2 inches with a 16 inch clear spacing. Rungs shall not be less than 3/4 inch, round or square, spaced at 12 inch centers. The surface of the rungs shall be knurled, dimpled, or otherwise treated to minimize slipping. At platforms or landings, the ladder shall extend a minimum 4 feet above the platform. Ladders shall be secured to adjacent structures by brackets located at intervals not exceeding 10 feet. Brackets shall be of sufficient length to provide a minimum distance of 7 inches from the center of the rung to the nearest permanent object behind the ladder.
 2. 6' Security ladder guard to prevent unauthorized use shall be provided.
 - a. Cotterman or engineered equivalent.
 - b. Ladder guard is mounted directly over the ladder climbing rungs.
- C. Fall Protection
 1. Ladders shall be equipped with a Fixed Ladder Vertical fall arrest system meeting OSHA regulations. The system shall be supplied complete with safety harnesses, locking mechanisms, lanyards, vertical lifeline, brackets, cable, cable guides, and accessories for two persons.
- D. Roof Handrail

1. A roof handrail shall be provided surrounding the roof manholes, vents and other roof equipment. Handrail shall comply with OSHA requirements.

3.4 OPENINGS

A. Roof Hatches

1. 30"x30" Roof manway, 2 required. Manways shall have steel cover, 3/16" thick, with 2" overhanging lip, gasket seal inside, with minimum 4" high neck. Manways shall have hinges, hasp, and lifting handle.

B. Tank Vent

1. The tank vent should be centrally located on the tank roof above the maximum weir crest elevation. The tank vent shall have an intake and relief capacity sufficiently large that excessive pressure or vacuum will not be developed during maximum flow rate. Maximum flow rate should be based on a break in the inlet/outlet pipe when the tank is full. The vent shall be designed, constructed and screened so as to prevent the ingress of wind driven debris, insects, birds and animals. The vent should be designed to operate when frosted over or otherwise clogged. The screens or relief material shall not be damaged by the occurrence and shall return automatically to operating position after pressure or vacuum is relieved.

C. Rigging

1. Interior and exterior rigging devices shall be provided for painting, inspecting and maintaining the structure and accessories. A continuous bar or tee rail near the top of the exterior support structure shall be provided. A painter's rail attached to the roof, pipe couplings with plugs in the roof or other attachments that provide complete access for painting of tank interior shall be furnished.

D. Piping

1. General
 - a. Exterior of pipes exposed to stored water shall be coated with tank interior wet system.
2. Inlet/Outlet Piping
 - a. Provide a 16 - inch diameter standard weight steel inlet and outlet pipe as shown in drawings.
3. Overflow
 - a. The overflow pipe shall be designed to carry the maximum design flow rate of 2,100 GPM. The steel overflow pipe will be 16 inch in diameter and shall have a minimum wall thickness of 1/4". A suitable weir shall be provided with the crest at High Water Level. The overflow pipe shall be as shown in drawings.

E. Identification Plate

1. A tank identification plate shall be mounted near the ladder platform. The identification plate shall be corrosion resistant and contain the following information.
 - a. Tank Contractor
 - b. Contractor's project or file number
 - c. Tank capacity
 - d. Height to High Water Level
 - e. Date erected

3.5 GUARANTEE

- A. The tank Contractor shall guarantee its work for a period of one year from the completion date defined in the contract documents to the extent that it will repair any defects caused by faulty design, workmanship or material furnished under the specifications. If Contractor is not advised of any defects within 30 days of end of guarantee period, guarantee shall be considered fulfilled and complete. Defects caused by damaging service conditions such as electrolytic, chemical, abrasive or other damaging service conditions are not covered by this guarantee.
- B. All guarantees obtained by the tank Contractor from the manufacturer or installer of paint, equipment or accessories not manufactured by tank Contractor shall be obtained for the benefit of the Purchaser.

END OF SECTION 43 41 20

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SECTION 43 50 00 – SUBMERSIBLE TANK MIXER

PART 1 - PART 1 – GENERAL REQUIREMENTS

1.1 SCOPE

- A. Section includes furnishing and the installation of the following equipment:
 - 1. Potable water storage tank mixing system.

1.2 SUBMITTALS

- A. Shop Drawings and Product Data: Submit detailed specifications, drawings, electrical wiring diagrams, and data covering all materials, parts, devices, equipment, and other accessories forming part of equipment for the complete operational system. Mark each submittal to show which products and options are applicable to the project.
- B. Include the following information, as applicable:
 - 1. Manufacturer catalog cut sheets.
 - 2. NSF Certification listings for all wetted parts of the mixer, mount, and power cable placed inside of the tank.
 - 3. Installation, start-up, operation, and maintenance manuals/instructions from the equipment manufacturer.
 - 4. Availability and delivery time information.
- C. Manufacturer's Instructions: Furnish manufacturer's printed instruction for delivery, handling, storage, assembly, installation, start-up, wiring diagrams, and factory-recommended maintenance schedule, as appropriate.
- D. Operations and Maintenance Data: Submit data on all parts, devices, equipment, and other accessories furnished forming the complete operational system.

1.3 STANDARD SPECIFICATIONS

- A. All work on the water storage tank shall fully conform to the requirements of the latest published editions of the following Standard Specifications:
 - 1. Occupational Safety and Health Administration, OSHA.
 - 2. NSF / ANSI Standard 61 and 372.
 - 3. Underwriters Laboratories Inc., UL 508.
 - 4. AWWA C652-11, Disinfection of Water Storage Facilities.
 - 5. ETL – Edison Testing Laboratories (Intertek).
 - 6. CSA – Canadian Standards Association.
 - 7. NEC – National Electric Code.
 - 8. NEMA – National Electrical Manufacturer's Association.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. All Products that may come into contact with water intended for use in a public water system shall meet ANSI/NSF International Standard 61/ANSI 372 certified to conform with new lead content requirements for “lead-free” plumbing as defined by the US Safe Drinking Water Act.
- B. Equipment shall have no visual defects and shall have high quality welds, assembly.
- C. Qualified US Manufacturer: The equipment shall be manufactured in the continental United States.
- D. The equipment manufacturer must have at least 50 continuous years’ experience in the design, application, and manufacture of mechanical agitation, mixing, and aerator assemblies of similar size and capacity. All material and equipment shall be new and of the highest quality.
- E. Manufacturer must have a dedicated engineering team including design, mechanical, quality, and electrical qualifications.
- F. Manufacturer must have documented quality requirements and procedures which include component sampling and testing, build instructions, Hi Pot and pressure decay testing, as well as bench rotation verification.
- G. Manufacturer must have a dedicated in-house service and repair department.
- H. Manufacturer must have dedicated customer service team.
- I. Mixers, complete with motor, power cable, and optional control panel shall be furnished by the manufacturer to ensure compatibility and integrity of the individual components and provide the specified warranty for all components.
- J. In order to assure uniform quality, ease of maintenance, and minimal parts storage, it is the intent of these specifications that all mixer assemblies and accessories called for under this section shall be supplied by a single manufacturer or authorized sales representative. The authorized sales representative shall, in addition to the Contractor, assume the responsibility for proper installation and functioning of the equipment if contracted for the installation and maintenance of the equipment.

1.5 FACTORY TESTING

- A. Each mixing system shall be factory tested and certified to UL778 and CSA C22.2#108 prior to leaving the place of manufacture
- B. Each mixer shall be tested and pass a Hi Pot test, pressure decay test, and direction of rotation check prior to shipment.

1.6 THIRD PARTY TESTING

- A. Mixers shall be certified by NSF International to NSF61 and 372 standards.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivered materials shall be stockpiled and stored at locations approved by the Owner until required for installation. Materials shall be stored in accordance with manufacturer's instructions.
- B. Contractor shall inspect materials for loss or damage in transit immediately upon delivery. Contractor shall be responsible for the replacement of damaged materials. All damaged materials shall be removed from the Site.
- C. Delivery and start-up shall be supplied by a factory trained and authorized equipment distributor representative.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- A. Approved Manufacturers:
 - 1. Kasco Marine, Inc. of Prescott, Wisconsin
 - 2. Pax Water Technologies, Inc.
 - 3. Or be a pre-approved equivalent by the Engineer. To offer equipment as a pre-approved equivalent, a written application from the alternative supplier shall be submitted to the Engineer a minimum of TEN (10) days prior to the scheduled bid opening. Provide a list of at least five (5) installations of the proposed equipment in a similar application for review by the Engineer. The list shall include the contact name and phone number for each installation. Alternates must meet or exceed blend time performance.

2.2 PERFORMANCE

- A. The manufacturer guarantees that the subject tank will be completely mixed by the mixer. Requirements are to be validated by Owner after installation. In continuous operation of the mixer:
 - 1. The Temperature Uniformity for tanks up to 100,000 gallons in volume shall converge to (.5 degree C) 0.9-degree F within eight (8) hours after mixer activation.
 - 2. The Chlorine Concentration Uniformity for tanks up to 100,000 gallons in volume shall converge to 0.2 mg/l within eight (8) hours after mixer activation.
- B. Submersible potable water mixer system shall be designed with the operating and design requirements to meet the project objectives. The following quantity and model number of equipment are approved:
 - 1. One (1) Kasco Marine Certisafe model (*Model # 24C61050SM-CS15*) or
 - 2. One (1) Pax Water Technologies model (*Model # PWM150V3*) or
 - 3. Pre-approved manufacturer model as stated earlier in "Approved Manufacturer" section

2.3 GENERAL

- A. The uniquely designed mixing unit shall consist of a non-metallic propeller mounted on a submersible motor to produce maximum thrust while using minimum horsepower.
- B. Operation of the mixing unit shall be independent of the tank drain and fill cycles to ensure constant mixing.
- C. The Mixer assembly shall be supported either from the tank floor, roof, or a pipe mount.
- D. The mixer shall be capable of operating in depths of up to 50 feet of water (20 psi) above the mixer.
- E. The mixing system installation shall be designed to be completed by on-site personnel without additional lifting equipment.
- F. The submerged portion of the mixing system shall weight less than 65 pounds.
- G. The propeller shall be constructed of proprietary non-metallic materials and shall be sized and designed according to the mixer horsepower.
- H. The Mixing unit shall have a low center of gravity and maximum height not exceeding 30 inches to prevent accidental tip-over.
- I. Mixers using a submersible pump with a slit, "water sheet" are not acceptable.
- J. Mixers that provide a downward thrust of water directly on the tank floor are not acceptable.
- K. Mixers that are free-floating and/or can move around the tank are not acceptable.
- L. The power source for the mixer shall be 120VAC single phase grid power to allow the unit to operate continuously, (24 hours per day, 7 days per week, 365 days per year), where necessary.

2.4 CONSTRUCTION

- A. Stainless Steel Construction. Metallic parts of the mixer shall be constructed of Series 300 stainless steel.
- B. Equipment entering the tank shall not adhere to, scratch, or otherwise cause damage to internal tank coatings or put undue stress on the materials of the tank construction.
- C. Equipment shall fit through a standard hatch of size 24-inch x 24-inch or larger.
- D. The motor housing shall be 300 Series stainless steel and oil-filled food grade mineral oil. The motor top shall be sealed with a double O-ring and the shaft area shall be sealed with a two-piece, carbon-ceramic seal. All fasteners and metal components exposed to the pumped liquids shall be Series 300 stainless steel.
- E. The pump and motor shall be designed so that they will operate in a fully-submerged condition in the water. Each motor shall be capable of and rated for continuous operation duty without

exceeding temperature rise limits for the motor insulation system. Unit shall be tested to withstand 20 psi external pressure.

- F. A thermal overload shall be attached to the motor winding and shall stop the motor if motor winding temperature reaches 140 degrees C (applies only to single phase motors). Thermal overload shall reset automatically when motor cools.
- G. The motor shall be constructed with bearings providing a L-10 life of >200,000 service hours.

2.5 FEATURES

- A. Each submersible mixer system shall consist of the following components regardless of the power source selected:
 - 1. Mixer:
 - a. Body shall be constructed of Series 300 stainless steel.
 - b. Mechanical seals shall consist of two unitized heavy-duty carbon ceramic seals.
 - c. Mixer shall be fully submersible with direct drive with no gearbox.
 - d. Mixer shall include a PVC coated cage surrounding the propeller to keep the propeller from contacting any storage tank coatings, power cable, retrieval chain or water storage tank structure.
 - e. Mixer shall have food grade mineral oil lubrication.
 - f. Motors shall be 1750 RPM, single speed, oil cooled, Class B insulated, continuous duty rated, with built-in thermal overload protection.
 - g. Motors shall be custom built per manufacture's specifications for use in submersible mixing applications.
 - h. Propellers shall be custom, non-metallic, and designed to maximize the unit's water moving performance without increasing the amp draw.
 - i. Mixer shall not exceed 65 lbs.
 - j. Units shall be easily installed and maintained by one or two persons.
 - 2. Underwater Power Cable:
 - a. The underwater power cable shall be UL, CSA, and NEC approved underwater rated, 3 conductor cable with open wires for hard wiring.
 - b. The power cable shall be available in 50 feet cord lengths.
 - c. An underwater approved, potted, O-ring sealed quick disconnect shall be available on all cables with 12 gauge or larger cables approximately 30 inches from the motor housing. The quick disconnect shall be a UL and CSA recognized and IP68 rated connector.
 - d. The power cable shall fit through a one-inch diameter penetration.
 - e. Mixer Mounting Options:
 - f. Suspended Mount – for mounting mixer in elevated water towers and standpipes.
 - g. Suspension kit shall include 316 Stainless Steel hardware. The mixer body shall be connected to the suspension bar so that the propeller is oriented upwards.
 - h. Stainless steel retrieval chains, power cable strain relief, and tank penetration fittings shall be provided.
 - 3. Control Panel Options: Each 120VAC control panel shall be built to the following specifications:
 - a. Each mixer shall be provided with a control panel capable of disconnecting power to the mixer.
 - b. Panel shall include a pad-lockable enclosure door.
 - c. NEMA 4X UL Type rated control panel with integral mounting tabs.

- d. UL 508A Listed industrial enclosed control panel.
- e. Exterior mounted ON/OFF switch, "RUNNING" indicator LED pilot light, and "FAULT" indicator LED pilot light all UL Type 4X rated.
- f. Shall include a circuit breaker for 120/240VAC, single-phase power.
- g. Power source required shall be supplied by others. Reference Electrical Drawings and Specifications.
- h. CS-100 control panel features:
- i. Dry contact relay closure provided by others.
- j. GFCI protection (sized per mixer) shall be supplied by others.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Contractor shall inspect all equipment immediately upon receipt.
- B. The equipment shall not be installed, if damaged, until repairs have been made in accordance with the manufacturer's written instructions.

3.2 INSTALLATION

- A. Contractor shall furnish a trained installation team familiar with installation procedures and requirements for the specified mixer system. The mixer may be installed with or without draining the tank.
- B. Contractor shall furnish the unit and install per manufacturer's recommendations. Coordinate work with the Electrical Contractor for all wiring and controls work to make a complete and operational system. Installation and start-up of all equipment shall be per the manufacturer's recommendations. Contractor shall:
 - 1. Ensure proper machine spatial placement in the tank.
 - 2. Ensure proper intake depth setting.
 - 3. Mixing system shall be installed complete with all necessary connections.
 - 4. Disinfect all wetted components prior to installing unit in water storage tank in accordance with AWWA C652-11 standards. Standard recommends spraying with a 200ppm NSF60 approved chlorine solution.
- C. Tank penetrations are recommended to be above the tank high water level.
 - 1. Fittings shall prevent moisture intrusion into the tank.
 - 2. Fittings shall be sized with the appropriate diameter to allow electrical power cable to pass through.
 - 3. A cable strain relief for power cable shall be supplied with each mixer.
- D. Installation of the submerged components may be performed by the following methods:
 - 1. Certified potable water tank diver.
 - 2. Personnel with confined space training while the tank is drained and empty.
 - 3. Tank manufacturer personnel during tank manufacture or construction.
 - 4. Contractor from a tank hatch opening.

- E. Installation of the control components may be performed by:
 - 1. Third party representatives or the Contractor.
 - 2. The Owner in accordance with the manufacturer supplied manual.
- F. The mixing system shall be installed in accordance with manufacturer's procedures, unless otherwise approved in writing from the manufacturer.

3.3 FIELD SERVICE

- A. Manufacturer's authorized representative shall check and inspect the mixer(s) after installation, place the mixer(s) in operation, and make necessary adjustments including low water inhibit feature in control panel.
- B. Manufacturer's authorized representative shall instruct designated Owner personnel in the safe and proper operation of the mixing system. This training shall reference the operations manual provided and demonstrate proper function of the equipment.

3.4 SPARE PARTS

- A. Contractor shall provide spare parts as recommended or supplied with this mixer assembly by the equipment manufacturer.

3.5 WARRANTY REQUIREMENTS

- A. Warranty: A written manufacturer's warranty shall be provided for the equipment specified in this Section. The Product shall be warranted to be substantially free from defects in material and workmanship for three (3) years from the date of delivery of all mixing equipment. This equipment warranty shall be directly from the manufacturer of the equipment to the Owner. Such warranty shall cover all defects or failures of materials or workmanship that occur as the result of normal operation and service.

END OF SECTION

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MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

OWNER: _____ EQPT SERIAL NO: _____
EQPT TAG NO: _____ EQPT/SYSTEM: _____
PROJECT NO: _____ SPEC. SECTION: _____

I hereby certify that the above-referenced equipment/system has been: (Check All applicable)

☐	Installed in accordance with Manufacturer's recommendations.
☐	Inspected, checked, and adjusted.
☐	Serviced with proper initial lubricants.
☐	Electrical and mechanical connections meet quality and safety standards.
☐	All applicable safety equipment has been properly installed.
☐	System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one manufacturer)

Comments: _____

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

Date: _____

Manufacturer: _____

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

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ELECTRICAL & INSTRUMENTATION SPECIFICATIONS

DIVISION 26

26 00 01	Basic Materials and Methods for Electrical Installations
26 27 26	Wiring Devices

DIVISION 40

40 61 96	Control Narratives
40 70 00	Instrumentation for Process Systems



Matthew Moore

03/08/2024

SECTION 26 00 01

BASIC MATERIALS AND METHODS FOR ELECTRICAL INSTALLATIONS

PART 1 GENERAL

1.1 SUMMARY

- A. It is the intent of the contract documents that upon completion of the electrical work, the entire system shall be in a finished workable condition. Therefore, furnish all work, labor, tools, superintendence, material, equipment, and accessories necessary to provide for a complete and workable electrical system as defined by the contract documents.
- B. All work that may be called for in the specifications but not shown on the drawings, or all work that may be shown on the drawings but not called for in the specifications, shall be formed by the Contractor as if described in both. Should work be required which is not set forth in either document, but is nevertheless required for fulfilling the intent thereof, then the Contractor shall perform all such work as fully as if it were specifically set forth in the contract documents.
- C. The drawings and specifications of other divisions of this contract, as well as supplements issued thereto, information to bidders, and other pertinent documents issued by the Owner's Representatives are a part of these drawings and specifications and shall be complied with in all respects. All the above documents will be on file at the office of the Owner's Representative and shall be examined by the Contractor. Failure to examine all documents shall not relieve the Contractor of any responsibility nor shall it be used as a basis for additional compensation due to omission of details of other divisions from the electrical documents.
- D. The use of the word "furnish" or "install" or "provide" shall be taken to mean that the item or facility is to be both furnished and installed unless specifically stated to the contrary.
- E. The use of the term "as (or where) indicated"; "as (or where) shown"; "as (or where) specified"; or "as (or where) scheduled" shall be taken to mean that the reference is made to the contract documents, either under the drawings or the specifications, or both documents.
- F. The Contractor shall be responsible for visiting the site, checking the existing conditions, and shall determine the conditions to be met for installing the work and plan accordingly.

1.2 RELATED WORK

- A. Section 26 27 26 – Wiring Devices
- B. Section 40 61 96 – Control Narratives
- C. Section 40 70 00 – Instrumentation for Process Systems

1.3 SUBMITTALS

- A. The following is also applicable to all Sections listed above.

- B. Each submittal shall be accompanied by a cover memo in which the contents of the submitted documents are described. This memo shall identify the project, whether the documents are "For Information", "For Review and Approval", or "For Record", and shall identify to which specification and Section the attached documents are attempting to fulfill the submittal requirements thereof. Any documents submitted without the reference to which specification and Section they are attempting to fulfill shall be rejected in whole without review.
- C. Submit the following:
1. For Information:
 - a. Equipment outline drawings showing elevation, plan and interior views, front panel arrangement, dimensions, weight, shipping splits, conduit entrances and anchor bolt pattern. Indicate all options, special features, ratings, and deviations from this Section. Furnish complete Bill of Materials indicating manufacturer's part numbers.
 - b. Elementary diagrams showing internal wiring of manufactured devices and assemblies.
 - c. Point to point wiring diagrams showing terminations and wire numbers for each assembly.
 - d. Dimension prints for each device or assembly.
 - e. Installation manual for each device or assembly.
 - f. Dimensions of areas required for servicing device or assembly.
 - g. Nameplate data and ratings for all devices.
 - h. Recommended spare parts and special tools list for maintaining equipment in service for one year and five-year periods.
 - i. Catalog literature for each device or assembly.
 2. For Review and Approval:
 - a. Review shall not remove responsibility for furnishing material or devices of acceptable dimensions, quantity, quality, or errors thereof.
 - b. Elementary (loop) diagrams showing schematically each device in a loop or control scheme, when not furnished with the "Issued For Construction" drawings.
 - c. Panel layouts with bills of material.
 - d. Specification and data sheets. Use manufacturer's format for non-instrument devices and ISA format for instruments.
 - e. Functional description of interlocks and control systems.
 - f. PLC/SCADA interlock ladder-logic diagram or program listing.

3. For Record:
 - a. Operation and maintenance manuals shall be compiled six weeks prior to project completion for each device or assembly.
 - b. Markup deviations to the Issued for Construction drawings with red pencil. Provide the original markup set to the Engineer for record.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements

1. Secure all permits, licenses, and inspections as required by all authorities having jurisdiction. Give all notices and comply with all laws, ordinances, rules, regulations, and contract requirements bearing on the work.
2. Codes and ordinances having jurisdiction over the work shall serve as minimum requirements, but, if the contract documents indicate requirements which are in excess of those minimum requirements, then the requirements of the contract documents shall be followed. Should there be any conflicts between the contract documents and codes, or any ordinances having jurisdiction, then report these.
3. Determine the exact requirements for the utility services as set by the utilities that will serve the facility, pay for and perform all work as required by those utilities. The Contractor shall notify the serving utility immediately upon award of the contract.

1.5 SEQUENCING

- A. Cooperate with all other trades to facilitate the general progress of the work. Allow other trades every reasonable opportunity for the installation of their work and the storage of their materials.
- B. The work under this Section shall follow the general building construction closely. Set all pipe sleeves, inserts, etc., and see that openings for cases, pipes, etc., are provided before concrete is placed or masonry installed.
- C. Work with other trades in determining the exact locations of outlets, conduits, fixtures, and equipment to avoid interference with lines as required to maintain proper installation of other work.
- D. Progress this work to not delay the work of other trades. Schedule the work so that completion dates as established by the Engineer are met. Furnish sufficient labor or work overtime to accomplish these requirements, if directed to do so.

1.6 COMMISSIONING

A. 600 Volt Wire Insulation Test

1. Test the insulation value of each service entrance cable, each feeder cable, and each branch circuit wire. Tests shall be made by means of a noncrank-type ohmmeter (megger) that impresses 1000 volts dc across the insulation. Test duration value shall be one minute.

2. Each ungrounded conductor shall have its insulation integrity tested after installation within its raceways from termination-to-termination. However, testing shall be made prior to connection to line or load.
3. Notify the Owner's Representative in writing 48 hours prior to testing. All such testing shall be done in the presence of the Owner's Representative and the test results shall be submitted in writing to the Engineer for review.
4. The insulation value of each installed cable and wire shall be equal to, or greater than 100 Megohms. Should the insulation value be less than 100 Megohms for any conductor tested, the faulty conductor shall be replaced, and re-tested until compliance is achieved.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All materials and devices shall conform to the requirements of the contract documents. They shall be new and free from defects and shall conform to the requirements of the latest edition of NFPA 70, the National Electrical Code.
- B. All materials and devices of the same class shall be supplied by the same manufacturer unless otherwise specified.

2.2 RACEWAYS AND FITTINGS

- A. Provide raceways and fittings as called for on the drawings. All conduit and fittings must be listed.
- B. Rigid metallic conduit shall be aluminum, inside and out. Conduit couplings shall be aluminum with hot-dipped galvanized finish.
- C. Non-metallic conduit that is direct buried shall be rigid polyvinyl chloride (PVC) schedule 40.
- D. Non-metallic conduit that is concrete encased shall be rigid PVC type EB.
- E. PVC coated rigid metallic conduit shall meet the specifications for rigid metallic conduit listed above. PVC coated rigid metallic conduit shall have a minimum 40 mil minimum thick PVC coating applied on exterior metallic surfaces, and a minimum 2 mil thick urethane coating applied on interior metallic surfaces. Couplings shall be sleeved.
- F. Flexible liquid-tight ferrous metallic conduit shall have an extruded thermoplastic cover with interlocked galvanized aluminum core.
- G. Rigid metallic conduit locknuts shall match the material used for rigid metallic conduit. Sealing locknuts shall have in addition to that specified above, an integrally fused thermoplastic gasket so that the locknut is rated NEMA 4.
- H. Rigid metallic conduit insulating bushings shall be molded canvas bake-a-lite type and suitable for operation in 100°C rise over 40°C ambient. Polypropylene bushings are not acceptable.

- I. Grounding type bushings shall have threaded steel body, insulated throat, and ground lug. Insulated throat shall meet specifications for rigid metallic conduit insulating bushings listed above.
- J. Rigid metallic conduit expansion/deflection fittings shall be watertight with a flexible plastic sleeve that allows $\frac{3}{4}$ " movements in all directions. Hubs shall be threaded, and match the material used for rigid metallic conduit. Clamping bands shall be stainless steel. There shall be an equipment bonding ground jumper.
- K. Rigid metallic conduit hubs shall be liquid-tight type with threaded female body, with sealing ring on conduit side and threaded male tapered steel body with hardened steel locknut on box side. Plastic jacketed hubs shall have 40 mils PVC coating.
- L. Chase nipples, reducers, enlargers, "Ericksons", capped Ls, short Ls, long Ls, split couplings and fittings shall be hot dipped galvanized malleable iron threaded type for use with rigid metallic conduit.
- M. Rigid metallic conduit bodies shall match the material used for rigid metallic conduit, with threaded hubs, gasketed cast metal covers, and stainless steel screws. Conduit bodies shall be Crouse-Hinds Form 7 Condulets, Appleton Form 35 Unilets, or Engineer approved equal for non-hazardous and Division 2 locations. Listed explosion-proof fittings shall be used in Division 1 locations.
- N. Liquid-tight flexible conduit fittings shall match the material used for liquid-tight flexible conduit, with captive grounding ferrule, sealing ring, and compression nut. Connector body shall have nylon-insulated throat. Pullout resistance of each completed connector shall be at least $1\frac{1}{2}$ times U.L. minimum.
- O. Cadmium plated devices and hardware shall not be acceptable.
- P. Any and all conduits penetrating fire rated walls shall do so only through listed openings having a fire rating equal to or greater than the fire rating of the wall which they penetrate. All such openings shall be installed in accordance with the manufacturer's instructions.
- Q. No conduit shall be embedded or concealed in a fire rated wall.

2.3 WIRING

- A. 600 Volt Wire and Cable
 - 1. All conductors and cables shall be listed.
 - 2. All conductors for power and control wiring shall be soft-drawn, stranded copper.
 - 3. Insulation for power and control circuitry shall be THHN/THWN rated for 600 V, 75°C, and installation in wet locations.
 - 4. Control wiring shall be #14 AWG, unless otherwise specified.
 - 5. All connectors shall be rated for 75°C.
 - 6. The ampacity of all conductors and connectors shall be on the basis of a 75°C rating.

7. Bare conductors for grounding purposes shall be hard-drawn stranded copper.
 8. Factory pigmented insulation color shall be used. In sizes where colored insulation is not available, cables shall be coded using colored electrical tape. Color coding shall match the existing electrical system's color code. For new installations, the following color code shall be as follows:
 - a. 240/120 VAC, 1-Phase, 3 Wire, and 208Y/120 VAC, 3-Phase, 4 Wire
 - Phase A – Red
 - Phase B – Black
 - Phase C – Blue
 - Grounding Conductor – Green
 - Neutral (Grounded) Conductor – White
 - b. 240/120 VAC, 3-Phase, 4 Wire, Delta Center Tap and 480Y/277 VAC, 3-Phase, 4 Wire
 - Phase A – Brown
 - Phase B – Orange
 - Phase C – Yellow
 - Grounding Conductor – Green
 - Neutral (Grounded) Conductor – Grey
- B. Instrumentation and SCADA Cable
1. All cables shall be listed.
 2. Conductors shall be #16 AWG tinned copper stranded (19x29).
 3. Cables shall be 32 mil polyethelene insulated, twisted pair or triad with aluminum-polyester shield, #18 AWG stranded tinned copper drain wire, with an overall 32 mil chrome vinyl jacket, rated for 600 V.
- C. Connectors
1. Mechanical connectors shall be bolted pressure type with tin-plated bronze body and tin-plated silicon-bronze hardware.
 2. Insulated setscrew connectors shall consist of copper body with flame-retardant, 600V class insulated shell. Such connectors shall be Ideal, T&B, 3M, or equal.
 3. Terminal connectors for flat-head terminal screws shall be locking spade type with vinyl insulated compression indent shaft, T&B, Ideal, Amp, or equal.
 4. Terminal strips shall be channel-mounted types with tin-plated solderless box lugs contained with barriered nylon-insulated separable barriers. Such devices shall be Square D, Cutler-Hammer, Allen Bradley, or equal.

D. Insulating Products

1. General purpose electrical tape shall be 7 mil thick stretchable vinyl plastic, pressure-adhesive type. Plymouth "Slipknot Grey", 3M "Scotch #33, or equal.
2. Insulation putty shall be rubber-based, non-vulcanizing, elastic-type putty in tape form; Plymouth #2074, 3M "Scotchfill", or equal.
3. High Temperature, insulating void filling, moisture-proof tape shall be stretchable ethylene propylene rubber with high-tack, self-fusing surfaces. Tape shall be rated for 90°C continuous, 130°C overload. Such tape shall be Plymouth "Plysafe", 3M Scotch 23", or equal.
4. High temperature protective tape shall be rated 180°C continuous, Indoor/outdoor and shall be cured, self-fusing silicone rubber. Such tape shall be Plymouth "Plysil", 3M "Scotch 70", or equal.
5. Arc and fireproofing tape shall be oil and water resistant, heat resistant, fabric reinforced; Plymouth "Plyarc #3318", 3M "Scotch 7700", or equal.

E. Labels

1. Marking labels for wire numbering shall be typed-on heatshrink plastic. Such labels shall be Raychem "Shrinkmark", or equal.
2. Write-on type labels for identification of conduits shall be weather resistant polyester with flat surface for marking pen application.
3. Colored bonding tape shall be 5 mil stretchable vinyl, self-adhesive (with permanent solid colors corresponding to hereinbefore specified wire colors) Plymouth "Slipknot 45", 3M "Scotch 35", or equal.

2.4 ENCLOSURE TYPES

A. Unless otherwise specified, electrical enclosures shall be NEMA Types as follows:

1. NEMA 1 and NEMA 12 in dry, non-process, indoor, above grade locations. (i.e., electrical rooms, control rooms, pump rooms).
2. NEMA 3R, NEMA 4, and NEMA 4X in damp or wet indoor locations, and outdoor locations. Specific NEMA type for each equipment enclosure shall be identified on the drawings. Otherwise, Contractor shall provide NEMA 4 for non-corrosive wet locations, and NEMA 4X for corrosive wet locations.
3. Enclosures shall be painted steel, unless otherwise stated on the drawings.

2.5 BOXES

A. Dry Location Boxes

1. Outlet boxes shall be zinc-galvanized, extra depth, pressed steel with knockouts and of size and type suitable for the intended application.

2. Boxes that are less than 100 cubic inches in size used for junction or pull boxes shall be zinc galvanized pressed steel not less than 14 USS gauge with appropriate blank covers, minimum size 4-11/16-in square by 2-1/8-in deep.
3. Boxes that are 100 cubic inches and larger shall be constructed of hot dip galvanized sheet steel without knockouts. Covers shall be secured with round head brass machine screws. All joints shall be welded and ground smooth.
4. Terminal enclosures shall be NEMA 12 sheet steel unless otherwise shown on the drawings. Boxes shall be painted and have continuously welded seams. Welds shall be ground smooth and galvanized. Box bodies shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14-gauge metal and covers shall not be less than 12-gauge metal. Terminal boxes shall be furnished with latching hinged doors, terminal mounting straps and brackets. Terminal blocks shall be rated not less than 20A, 600V.
5. Acceptable Manufacturers are Racal, Saginaw, Hoffman, or equal.

B. Wet Location Boxes

1. NEMA 4 terminal boxes, junction boxes, pull boxes, etc., shall be powder painted steel inside and out, unless otherwise shown on the drawings. Boxes shall have continuously welded seams and mounting feet. Welds shall be ground smooth. Boxes shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14-gauge metal and covers shall not be less than 14-gauge metal. Covers shall be gasketed and fastened with stainless steel clamps or latches. Terminal boxes shall be furnished with hinged doors, terminal mounting straps and brackets.
2. Cast or malleable iron device boxes shall be Type FD. Boxes and fittings shall have cadmium-zinc finish with cast covers and stainless steel screws.
3. Cast aluminum device boxes shall be Type FD. Boxes and fittings shall be copper free aluminum with cast aluminum covers and stainless steel screws.
4. Acceptable Manufacturers are Crouse-Hinds, Saginaw, Hoffman, or equal.

2.6 DUCTBANKS

A. Detectable Warning Tape (Tracer Tape)

1. Each direct buried duct bank section shall be marked by means of a detectable warning tape as shown on the drawings. The detectable warning tape shall be capable of being detected or located by either conductive or inductive location techniques.
2. Detectable warning tape shall be polyethylene film with a metalized foil core and shall be 4-6 inches (75-150 mm) wide. Tape shall be red with black letters marked "CAUTION – ELECTRICAL LINED BURIED BELOW".

B. PVC Duct Spacers

1. PVC duct spacers shall be installed for more than one conduit in the duct bank. Duct spacers shall be of the type recommended by the conduit manufacturer.
2. Follow manufacturer's recommendation for spacing between duct spacers.
3. PVC spacers and mounts shall be used for supports and spacing of the conduits for encased concrete conduits. Do not use concrete blocks or other means as supports for conduits.

2.7 EQUIPMENT IDENTIFICATION NAMEPLATES AND SIGNS

- A. Equipment identification nameplates shall be engraved, laminated plastic, not less than 1/16" inch thick, lengths as required to accommodate lettering, and in ¾" and 2½" widths with minimum 3/16" high letters. Each plate shall have adhesive backing with pull-apart resistance of at least 100 psi. Plates shall be laminated type with black background and white letters. Nameplates shall be installed on all motor starters, switches, control panels, panelboards, etc. Nameplate designations are shown on the drawings.
- B. Signs shall be similar to nameplates described above with the size, type, and wording as indicated on the contract drawings.

2.8 SUPPORTING DEVICES

- A. Slotted channel supports and framing members shall be cold rolled steel. Finish for inside, dry location in finished areas (such as offices) shall be factory painted with baked-on enamel. Finish for outside and damp or wet locations shall be hot dipped galvanized after fabrication. Size of slotted channels unless otherwise indicated, shall be 1½" x 1½" in cross-section. Acceptable manufacturers are Unistrut, Elcen, B-Line Systems or equal. Special purpose slotted channel support shall be furnished as indicated.
- B. Hanger rods shall be hot dipped-galvanized and shall be all-thread type, ¾" minimum diameter and length as required.
- C. Beam clamps, side-beam connectors, and one-hole clamps shall be hot-dipped galvanized malleable iron, and shall be Steel City, T&B, or OZ/Gedney. Plastic coated types shall have 40 mils, minimum PVC covering.
- D. Pressed steel, two-piece single bolt, slotted channel conduit straps shall be electro-galvanized and shall be of the same manufacturer as the slotted channel. Plastic coated types shall have 40 mils minimum PVC covering and hardware shall be stainless steel.
- E. Single rod-hung "J" conduit clamps shall be adjustable type with hot dipped galvanized finish and shall be Unistrut, Elcen, or equal.
- F. Indoor, dry-location slotted channel hardware (nuts, bolts, washers, etc.) shall have electro-galvanized finish. Outdoor, wet location slotted channel hardware shall be stainless steel.
- G. Stainless steel hardware shall be AISI Type 304 or 316.
- H. Concrete and masonry anchors shall be stainless steel type equal to Hilti brand.

2.9 GROUNDING DEVICES

- A. Ground rods shall be copper clad steel, $\frac{3}{4}$ " dia. X 10' long, unless otherwise specified.
- B. Ground rod connectors shall be copper alloy with silicon bronze bolts and in sizes to fit ground rod diameters. Furnish OZ/Gedney, Burndy, or equal.
- C. Pipe ground connectors shall be copper alloy with silicon bronze bolts and in sizes to fit pipe diameter. Furnish OZ/Gedney, Burndy, or equal.
- D. Thermal welding devices shall consist of correct size molds to fit application and correct amount of weld metal. Furnish Erico "Cadweld", Burndy "Thermoweld", or equal.
- E. Ground rod test wells shall be complete with cast iron riser ring and traffic cover marked "GROUND". Boxes and covers shall be suitable for H20 wheel loading if installed in a paved area. Ground test wells shall be Erico, Christy, or equal.

2.10 LUMINAIRES

- A. Luminaires shall be provided as shown on the plan drawings.
- B. Lamps, housings, mounting brackets, ballasts, and other required appurtenances shall be provided to present a complete operable unit.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Except where specifically detailed or shown, the locations and elevations of equipment are approximate and are subject to small revisions as may prove necessary, or desirable, at the time the work is installed. Final locations shall be confirmed with the Engineer in advance of construction. Confirmed locations shall be made for the following: poles, receptacles, rough-ins and connections for equipment furnished under other sections, lighting fixtures, outlets, motor control centers, switchboards, panelboards, etc.
- B. Where equipment is being furnished under another Section, request from the Engineer an accepted drawing that will show exact dimensions of required locations of connections. Install the required facilities to the exact requirements of the approved drawings.
- C. The drawings are diagrammatic and do not give exact details as to elevations or routings of conduits, nor do they show all offsets and fittings; nevertheless, install the conduit system to conform to the structural and mechanical conditions of the construction. Unless locations and routing of exposed conduits are dimensioned, confirm locations and routing prior to installation with the Engineer.

3.2 INSTALLATION

- A. All work shall be done in the best and most workmanlike manner by qualified, careful electricians who are skilled in their trade. The electrical Contractor shall employ a Texas licensed master electrician assigned to this project and all electricians serving this project shall be Texas licensed electricians. The standard of work required throughout shall be of the first class only and electricians whose work is unsatisfactory to the Engineer shall be

dismissed from the work upon written notice from the Engineer. All work must meet the approval of the Engineer.

- B. Cabling inside equipment shall be carefully routed, trained, and laced. Cables so placed that they obstruct equipment devices shall not be accepted.
- C. Equipment shall be set level and plumb. Supporting devices installed shall be set and braced so that equipment is held in a rigid, tight-fitting manner.

3.3 DUCTBANK

A. Duct bank

1. Install duct to locate top of duct bank at depths as indicated on drawings.
2. Install duct with minimum slope of 4 inches per 100 feet (0.33 percent). Slope duct away from building entrances.
3. Cut duct square using saw or pipe cutter. De-burr cut ends.
4. Insert duct to shoulder of fittings; fasten securely.
5. Join nonmetallic duct using adhesive as recommended by manufacturer.
6. Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
7. Install no more than the equivalent of three 90-degree bends between pull points.
8. Where bends in raceways are required, use long radius elbows, sweeps, and offsets.
9. Provide suitable fittings to accommodate expansion and deflection where required.
10. Provide suitable pull string in each empty duct, except sleeves and nipples.
11. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.
12. Backfill trenches.
13. Interface installation of underground warning tape with backfilling. Install tape at the depth shown on the drawings.

3.4 RACEWAYS

- A. Conduits and conductors for lighting, switches, receptacles and other miscellaneous low voltage power and signal systems as specified are not shown on the drawings. Raceways and conductors shall be provided as required for a complete and operating system. Raceways shall be installed concealed in all finished spaces and may be installed exposed or concealed in all process spaces. Raceways installed exposed shall be near the ceiling or along walls of the areas through which they pass and shall be routed to avoid conflicts

with HVAC ducts, cranes hoists, monorails, equipment hatches, doors, windows, etc. Raceways installed concealed shall be run in the center of concrete floor slabs, above suspended ceilings, or in partitions as required.

- B. Install the conduit system to provide the facility with the utmost degree of reliability and maintenance free operation. Kinked conduit, conduit inadequately supported or carelessly installed shall not be accepted.
- C. Raceways shall be installed for all wiring runs except as otherwise indicated.
- D. Conduit sizes, where not indicated, shall be code-sized to accommodate the number and diameter of wires to be pulled into the conduit. Use NEC tables for sizing.
- E. Exposed runs of conduit shall be installed parallel to the lines of the structure.
- F. PVC runs shall be joined with manufacturer's approved cement.
- G. Finished installation of conduit runs from each terminus to each terminus shall be watertight.
- H. Generally, raceways shall be installed exposed on the structures and in the buildings except as otherwise specified. Horizontal runs shall be supported on 24" centers and vertical runs on 48" centers.
- I. Conduit runs in finished areas within building shall be installed concealed within the structure but not in the slab, except as otherwise specified.
- J. Except where up-turns to structures and equipment is made. The upturn shall be made with 40 mil PVC coated steel 90° elbow and conduit. Depth of lateral runs shall be 24" minimum unless otherwise indicated. Coordinate installation with site work finished grades. Duct bank depths shall be as indicated on the drawings.
- K. Conduit runs that enter an enclosure without penetrating the sheet metal, such as bottom entry into motor control centers, shall be equipped with bushings.
- L. Conduit bodies such as "LB, "T", Condulets, Unilets, or equal shall be installed in exposed runs of conduit wherever required to overcome obstructions, and to provide pulling access to wiring. Covers for such fittings shall be accessible and unobstructed by the adjacent construction.
- M. Conduit shall enter all wireways, boxes, motor control centers, panelboards and other enclosures straight and true. Conduits installed cocked and not parallel to the lines of the enclosure shall not be acceptable.
- N. Conduit entrances into equipment shall be carefully planned. Cutting away of enclosure structure, torching out braces, and removal of enclosure channels and sills shall not be accepted.
- O. Use approved hole cutting tool for entrances into sheet metal enclosures. Use of cutting torch or incorrect tool shall not be accepted.
- P. Install expansion or expansion/deflection fittings where conduit runs across an expansion joint within the concrete, or where conduit runs across an expansion joint and the runs are rigidly attached to the structure.

- Q. Plastic jacketed flexible metallic conduit shall be used for connections to motors, solenoids, pressure switches, electric valve operators, unit heaters, motorized louvers, torque switch devices, flowmeters, limit switches, lay-in lighting fixtures, and other devices that may need to be removed for servicing in non-hazardous locations.
- R. Flex runs shall be joined with specified flex connectors and these connectors shall be made up tightly onto the lengths of flex and onto its connected devices. All plastic jacketed flexible conduit connections shall be watertight.
- S. Cap each end of conduits as soon as placed to prevent mud, dirt, debris, and water from entering raceways. Each run shall be swabbed clean prior to wire pulling.
- T. All junction and pull boxes shall be equipped with blank covers.
- U. All boxes shall be installed with their axes parallel to the lines of the building structure.

3.5 WIRING

- A. All conductors shall be the size as indicated on the drawings. Where no size is given, the conductor shall be sized to accommodate the full load current of the device as required by the National Electric Code.
- B. All wiring shall be installed in raceways unless otherwise indicated.
- C. All power and control wiring shall be made with insulated, stranded copper wire.
- D. No wire or cable shall be drawn into a conduit until all work of a nature which may cause injury is completed. A cable pulling compound shall be used as a lubricant and its composition shall not affect the conductor or its insulation.
- E. Do not exceed cable manufacturer's recommended pulling tensions.
- F. Service and feeder wiring runs shall be made from terminus to terminus without splice.
- G. Branch circuits shall run from supply to load without splice except where taps and splices are required for receptacle, light fixture, and small appliance loads.
- H. Taps, splices, and connections shall be made with tinned copper alloy compression connectors. Make up connection tightly to produce as low a resistance as if the conductor were continuous. Such connectors shall be insulated with a smooth cover of void-filling insulation putty and then covered with at least four (4) half lapped layers of electrical tape. Insulated connector shall have at least 1.5 kV insulation value.
- I. Specified sizes of wire shall be installed with factory-pigmented colors. Phase label black pigmented wires with colored banding tape as specified. Install labels at each terminus.
- J. Numbered marking labels shall be installed to identify circuit numbers from panelboards and to identify control wires. Install labels on each wire in each panelboard, junction and pullbox, and device and control connection.
- K. Label each wiring run with write-on waterproof labels inside each motor control center, switchboard, pullbox and handhole. Wrap label ties around wire group at conduit entrance and write on label the wire size, conduit size, and service.

- L. Control wiring that terminates onto flat head type terminals shall be equipped with crimp-type spade lugs. Label each wire with number to correspond with terminal strip number.
- M. All wiring inside enclosures shall be neatly trained and laced with tie-wraps.
- N. All raceway systems, outlets, boxes, wireways, cabinets, enclosures, lighting fixtures, transformers, and related equipment shall be adequately and safely supported with at least 3-1 safety factor.
- O. Slotted channels shall be used to support equipment that is mounted free of structure. Use factory fabricated back-to-back hot-dipped galvanized members 3¼" deep that have welded feet.
- P. Runs of exposed conduits shall be installed as follows:
 - 1. Single surface runs shall be attached to the structure by means of conduit clamps, except as otherwise specified. Single runs along structural members shall be supported by means of side beam clamps, or similar supporting devices.
 - 2. Multiple surface runs shall be attached to the structure by means of slotted channels. Each conduit shall be attached to the slotted channel by means of two-piece conduit clamps.
- Q. Rod hangers shall be hot dipped, galvanized all thread, ⅝" minimum diameter steel type. Paint each rod hanger and its support with undercoat and one finish coat of galvanized type paint.
- R. Rod hangers shall be attached to the structure with appropriate hanger such as concrete insert, beam clamp, ceiling flange, or side beam connector.
- S. Slotted channels that are field cut shall have raw edges painted with cold galvanized coating spray paint.

3.6 GROUNDING

- A. Install equipment grounding conductors with all feeders and branch circuits.
- B. Bond all steel building columns in new structures together with ground wire in steel conduit. Connect ground wires to the main distribution equipment ground bus, as shown on the drawings.
- C. Ground wire connections to structural steel columns shall be made with exothermic welds.
- D. Liquid tight flexible metal conduit in sizes 1½" and larger shall have bonding jumpers. Bonding jumpers shall be external, run parallel (not spiraled), and be fastened with plastic tie wraps.
- E. Ground transformer neutrals to the nearest available grounding electrode with a conductor sized in accordance with NEC Article 250.66.
- F. All grounding type receptacles shall be grounded to the outlet boxes with a #12 AWG THW green conductor connected to the ground terminal of the receptacle and fastened to the outlet box by means of a grounding screw.

- G. Molds used for thermal welding shall be new. The number of welds made per mold shall not exceed manufacturer's recommendations.
- H. Bond metal poles supporting outdoor lighting fixtures to a supplemental grounding electrode (rod) in addition to the separate equipment grounding conductor run with the supply branch circuit.
- I. Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with ground clamp connectors.
- J. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters and HVAC equipment. Use braided-type bonding straps.

3.7 EXCAVATION AND BACKFILLING

- A. Complete excavating and back-filling necessary for the installation of the work. This includes shoring and pumping in ditches to keep them dry until the work has been installed. Shoring required to protect the excavation and safeguard employees shall be properly performed
- B. All excavations shall be made to the proper depth, with allowances made for floor slabs, forms, beams, finished grades, etc. Soil under conduits shall be well compacted before conduits are installed.
- C. All backfill shall be made with selected soil, free of rocks and debris and shall be pneumatically tamped in six-inch layers to secure a field density ration of 90 percent, unless otherwise specified.
- D. All excavated material not suitable and not used in the backfill shall be removed to the on-site disposal area. The disposal area shall be as directed by the Engineer.

3.8 CUTTING AND PATCHING

- A. Cutting and patching required under this Section shall be done in a neat workmanlike manner. Cutting lines shall be uniform and smooth.
- B. Use concrete saws for large cuts in concrete and use core drills for small round cuts in concrete.
- C. Where large openings are cut through metal surfaces, attach metal angles around the opening.
- D. Patch concrete openings that are to be filled with nonmetallic, non-shrinking grout. Finished concrete patching shall be troweled smooth and shall be uniform with surrounding surfaces.
- E. No cutting of structural elements shall be done without permission of the Engineer.
- F. Where openings are cut through masonry walls, provide lintel or other structural supports to protect the remaining masonry. Adequate support shall be provided during the cutting operation to prevent damage to the masonry.

- G. Holes for raceway penetration into sheet metal cabinets and boxes shall be accurately made with a hole-punch. Cutting openings with a torch or other device that produces a jagged, rough-cut shall not be accepted.
- H. Raceway entry into equipment shall be carefully planned. Cutting of enclosure framework to accommodate poorly planned raceway placement shall not be accepted.

3.9 FLASHING

- A. Provide waterproof flashing for each penetration of exterior walls and roofs.
- B. Flashing for conduit penetrations through built-up roofs shall be made with pitch panel filled full with pitch.

3.10 REPAIR/RESTORATION

- A. Field check and verify the locations of all underground utilities prior to any excavation. Avoid disturbing these as far as possible. In the event existing utilities are broken into or damaged, they shall be repaired so as to make their operation equal to that before the excavation was started.
- B. Where the excavation requires the opening of existing walks, drives, or other existing pavement, these facilities shall be cut as required to install new lines and to make connections to existing lines. The sizes of the cuts shall be held to a minimum, consistent with the work to be installed. After installation of new work is completed and the excavation has been backfilled in accordance with the above, then repair existing walks, drives, or other existing pavement to match existing installation.

3.11 CLEANING

- A. Remove all temporary labels, dirt, paint, grease, and stains from all exposed equipment. Upon completion of work, clean equipment and the entire installation to present a first-class job suitable for occupancy. No loose parts or scraps of equipment shall be left on the premises.
- B. Equipment paint scars shall be repaired with paint kits supplied by the equipment manufacturer, or with an approved paint.
- C. Clean interiors of each item of electrical equipment. At completion of work, all equipment interiors shall be free from dust, dirt, and debris.

3.12 PROTECTION

- A. Provide suitable protection for all equipment, work, and property against damage during construction.
- B. Assume full responsibility for material and equipment stored at the site and incorporated within the project.
- C. Conduit openings shall be closed with caps or plugs during installation. All outlet boxes and cabinets shall be kept free of concrete, plaster, dirt, and debris.
- D. Equipment shall be covered and tightly sealed against entrance of dust, dirt, and moisture.

- E. Prior to energization, all dry type transformers shall be protected against moisture and dirt absorption by a suitable covering. Maintain heat inside the covering by means of incandescent lamps (200-watt minimum.)
- F. Interiors of switch gear and motor control centers shall be kept clean and dry prior to energization. Maintain heat inside each unit with one 200-watt lamp located at the bottom of each vertical section. Energizing integral condensation heaters shall be acceptable alternate.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.1 SUMMARY

- A. The Contractor shall furnish and install switches, receptacles, GFCI receptacles, and other wiring devices as specified in this Section and as shown on the drawings.

1.2 RELATED WORK

- A. Section 26 00 01 – Basic Materials and Methods for Electrical Installations

1.3 REFERENCES

- A. Wiring devices shall be designed, manufactured, and tested in accordance with the latest applicable standards of NEMA, ANSI, and NFPA. Refer to Section 26 00 01 for submittal requirements.

1.4 QUALITY ASSURANCE

- A. Wiring devices shall be listed by UL, CSA, FM, or an equivalent listing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Equipment shall be handled and stored in accordance with the manufacturer's instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. All wiring devices shall be specification grade, Arrow-Hart, Hubbell, or equal.

2.2 DEVICES

- A. Two-pole, 3-wire grounding 15 A/125 V, NEMA 5-15R duplex receptacle shall be Arrow-Hart #AH5262, Hubbell #HBL5262, or equal.
- B. Two-pole, 3-wire grounding 20 A/125 V, NEMA 5-20R duplex receptacle shall be Arrow-Hart #AH5362, Hubbell #HBL5362, or equal.
- C. Two-pole, 3-wire grounding 20 A/250 V, NEMA 6-20R single receptacle shall be AH #5461, Hubbell #HBL5461, or equal.
- D. Two-pole, 3-wire grounding 30 A/250 V, NEMA 6-30R single receptacle shall be AH #5700N, Hubbell #HBL9330, or equal.
- E. GFCI device shall be a duplex 5-15R, 15 A/125 V, 3-wire outlet with reset and test pushbuttons Arrow-Hart Catalog #TWRSGF15, Hubbell #GF5262SG, or equal.
- F. Single-pole, single-throw, 20 A toggle switch shall be AH #1221, Hubbell #HBL1221, or equal.

- G. Single-pole, double-throw (three-way) 20 A Toggle switch shall be Arrow-Hart #1223, Hubbell #HBL1223, or equal.
- H. Double-pole, double throw 20 A toggle switch shall be Arrow-Hart #1224, Hubbell #HBL1224, or equal.
- I. Manual motor controller shall be Allen Bradley Bulletin 600, Square D Class 2510, or equal, Select overloads to be 1.15 times motor FLA.

2.3 COVER PLATES

- A. Covers for wiring devices located outdoors in damp or wet locations shall have weatherproof covers, gaskets, and stainless steel cover screws.
- B. Covers for surface wiring devices located indoors and in dry locations shall be stainless steel type with beveled edges.

PART 3 EXECUTION

3.1 EXAMINATION

- A. The Contractor shall fully inspect shipments for damage. Report any observed damage to the manufacturer, and file a claim upon the shipper, if necessary.
- B. The following minimum work shall be performed by the Contractor:
 - 1. Examine the installation area to ensure the space is ready for installation of wiring devices.
 - 2. Verify that the equipment is ready to install.
 - 3. Verify field measurements match those shown on the drawings.
 - 4. Verify that the required utilities are available, in the proper location, and are ready for use.

3.2 INSTALLATION

- A. Follow the manufacturer's installation instructions.
- B. Mount devices 48" above finished floor, unless otherwise shown on the drawings.
- C. All cables inside wireways shall be neatly arranged, bundled, and bound with plastic tie-wraps.
- D. Tighten all wire and busbar connectors to manufacturer recommended torque settings.
- E. Apply anti-corrosive compound equal to Kopr-Shield to all wire terminations.

END OF SECTION

SECTION 40 61 96

CONTROL NARRATIVES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes functional descriptions for equipment operation that is added or altered by this project's scope of work.

1.2 RELATED WORK

- A. Section 26 00 01 – Basic Materials and Methods for Electrical Installations
- B. Section 40 70 00 – Instrumentation for Process Systems

PART 2 PRODUCTS

2.1 ALARMS & INDICATORS

- A. Alarm conditions shall be on open contact (broken wire sounds alarm).
- B. Alarms shall be:
 - 1. Integrated into logical displays.
 - 2. Provided with a first out alarm sequence.
 - 3. Audible and visual indication of status.
 - 4. Acknowledgement of alarm condition.
- C. Reset of alarm shall occur when the condition driving the alarm has returned to normal.
- D. Alarm setpoints shall be operator adjustable when derived from other than status contacts.
- E. Indicators (lights, values, etc.) shall be integrated into logical displays.
- F. SCADA system alarms and indicators shall be provided as shown on the drawings and as listed below.

2.2 CONTROLS

- A. Standpipe Operation
 - 1. The standpipe level controls shall be integrated into an existing booster pump control system at the pump station.
 - 2. A pressure transmitter (PT-5701) shall serve as the primary means of monitoring the tank level with a SPDT pressure switch (PSH/L-5701) serving as a backup in the event of transmitter failure.
 - 3. A solenoid valve (LV-5701) shall regulate water flow into the standpipe and a pair of duplex booster pumps shall draw water from the standpipe when called on by a remote elevated storage tank.

4. The existing PLC shall be reprogrammed so that the following control narrative is carried out automatically.
5. The standpipe level control system shall serve to maintain water level in the standpipe above a "MIN NORMAL" setpoint and below a "MAX NORMAL" setpoint.
6. At any level below "MAX NORMAL", LV-5701 shall be opened and allow water to flow into the standpipe.
7. When water level rises above "MAX NORMAL", LV-5701 shall close.
8. If water level continues to rise to a high level setpoint (LAH) or backup high level setpoint (LAHH), LV-5701 shall close and a high level alarm shall be sent to the SCADA system.
9. At any level above a "MIN NORMAL" setpoint the pump station booster pumps shall be allowed to operate based on calls from the Airport Elevated Storage Tank.
10. When water level falls below "MIN NORMAL" the booster pumps shall be locked out of operation. Booster pumps may only be allowed to restart if water level is above "MIN NORMAL".
11. If the water level continues to fall to a low level setpoint (LAL) or backup low level setpoint (LALL) the booster pumps shall be locked out of operation and a low level alarm shall be sent to the SCADA system.

B. Stand Pipe Mixer

1. See Section 43 45 50 for additional information.
2. The standpipe mixer shall be powered by a variable frequency drive and supplied with control appurtenances as shown on the drawings. The mixer has 3 modes of operation: Hand, Off, and Auto
3. In the Hand position, the mixer will run.
4. In the Off position, the mixer will not run.
5. In the Auto position, the mixer will run based on input from the SCADA system.

PART 3 EXECUTION

END OF SECTION

SECTION 40 70 00

INSTRUMENTATION FOR PROCESS SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. The Contractor shall furnish and install the instrumentation as specified in this Section and as shown on the drawings.

1.2 RELATED WORK

- A. Section 26 00 01 – Basic Materials and Methods for Electrical Installations
- B. Section 40 61 96 – Control Narratives

1.3 REFERENCES

- A. All instruments shall be designed, manufactured, and tested in accordance with the latest applicable standards of NEMA, ANSI, NFPA, and IEEE. Refer to Section 26 00 01 for submittal requirements.

1.4 QUALITY ASSURANCE

- A. Instruments shall be listed by UL, CSA, FM, or an equivalent listing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Equipment shall be handled and stored in accordance with the manufacturer's instructions.

1.6 OPERATION AND MAINTENANCE MANUALS

- A. Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets, instruction bulletins, and renewal parts lists where applicable for the complete assembly and each major component.

1.7 WARRANTY

- A. Manufacturer shall warrant equipment to be free from defects in materials and workmanship for 1 year from date of energizing.

PART 2 PRODUCTS

2.1 LEVEL

- A. LV-5701 – See Section 40 50 00.

2.2 PRESSURE

- A. PT-5701 – USA Bluebook industrial pressure transmitter model No. 16297 or approved equal.
- B. PS-5701 – Mercoid SPDT non-mercury pressure switch model No. DAW-7033-153-6 or approved equal.

2.3 SIGNAL CONDITIONING

- A. Signals shall be 4-20 mA, 24 VDC with unground negative.
- B. Each signal shall be provided with a surge protection device (SPD) at the input/output of its monitor or controller.

2.4 ENCLOSURES

- A. Each instrument shall be furnished with an enclosure suitable for the environment in which it is to be located. Enclosures shall be NEMA or IP rated.
- B. Instruments with indicators located outdoors shall be rated for use in direct sunlight, or the instrument shall be provided with a sunshade.

PART 3 EXECUTION

3.1 EXAMINATION

- A. The Contractor shall fully inspect shipments for damage. Report any observed damage to the manufacturer, and file a claim upon the shipper, if necessary.
- B. The following minimum work shall be performed by the Contractor:
 - 1. Verify that the equipment is ready to install.
 - 2. Verify field measurements match those shown on the drawings.
 - 3. Verify that the required utilities are available, in the proper location, and are ready for use.

3.2 INSTALLATION

- A. Follow the manufacturer's installation instructions.

END OF SECTION

APPENDIX A

GEOTECHNICAL REPORT



December 15, 2022

KSA Engineers, Inc.
4833 Spicewood Springs, Suite 204
Austin, Texas 78759

Attention: Ms. Angie Sanchez, P.E.
Municipal Team Leader

Reference: Geotechnical Report
Pump Station Standpipe
Killeen, Texas
LE Project No. W22-083
KSA Project No. KIL014

Dear Ms. Sanchez:

This letter transmits our geotechnical report, which has been electronically produced. We appreciate the opportunity to provide engineering services for you.

Once the project plans and specifications are completed, we would be pleased to review those portions that pertain to this report. We would also appreciate the opportunity to provide construction phase services such as materials testing as a part of the success of the project. If you have any questions regarding our report, please call me at (254) 235-1048.

Best Regards,

LANGERMAN FOSTER ENGINEERING COMPANY

Texas Registered Engineering Firm No. F-13144

A handwritten signature in black ink, appearing to read 'Joe L. Dickinson', is written over a light blue horizontal line.

Joe L. Dickinson, P.E.
Associate Principal/Geotechnical Engineer

Distribution List:

- KSA Engineers, Inc.- Ms. Angie Sanchez, P.E. (ASanchez@KSAEng.com)
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GEOTECHNICAL REPORT

Pump Station Standpipe

Killeen, Texas

LE Project No. W22-083



Report Prepared For:

KSA Engineers
Austin, Texas

Report Prepared By:



Joe L. Dickinson, P.E.
Associate Principal/Geotechnical Engineer



December 15, 2022

**GEOTECHNICAL REPORT
PUMP STATION STANDPIPE
KILLEEN, TEXAS**

1.0 INTRODUCTION

Purpose: The purpose of this geotechnical report is to provide geotechnical design and construction criteria for a new Standpipe in Killeen. Geotechnical data and recommendations are provided in a brief, and hopefully user-friendly manner.

Authorization: Services were performed in general accordance with LE Proposal No. GEO22-147, dated September 8, 2022. Authorization to proceed was provided by Joncie H. Young, P.E., Director of Client Services, via KSA Engineers Short Form Agreement Between Engineer and Consultant on November 1, 2022.

KSA Project No: KIL014

2.0 SUBSURFACE EXPLORATION

Drilling Date: November 17, 2022.

Boring Layout: The boring locations were marked in the field by LE personnel using a sketch provided by KSA Engineers. Plates 1 and 2 show the approximate boring locations.

Sampling Methods: Push-tubes were used to sample the softer clay soils. A split-spoon was used to sample stiffer clay, severely weathered limestone, and weathered limestone. The split spoon sampler was used in conjunction with standard penetration tests, and N-Values are recorded on the boring logs. Weathered limestone was cored with an NX-size core barrel. Water was used in the coring process to discharge cuttings and cool the cutting bit.

3.0 LABORATORY TESTS

Test Procedures: The following tests were conducted in general conformance with the standards noted in Table 3.1.

TABLE 3.1: LABORATORY TESTS	
Test Name	Test Method
Atterberg Limits	ASTM D 4318
-#200 Mesh Sieve	ASTM D 1140
Moisture Content	ASTM D 2216
Soil Classification	ASTM D 2487
Unconfined Compression (rock)	ASTM D 7012
Unconfined Compression (soil)	ASTM D 2166

Test Results: Laboratory test results are shown on Plate 3 in the Appendix, and selected test results on the boring logs.

4.0 SUBSURFACE MATERIALS AND SITE HISTORY

Stratigraphy: Major strata types for the borings are listed in Table 4.1. Individual boring logs are contained in the Appendix. Material descriptions are general and range of depths approximate because boundaries between different strata are seldom clear and abrupt in the field.

TABLE 4.1: MAJOR STRATA TYPES			
Strata	Depth to Top of Strata (ft)	Depth to Base of Strata (ft)	General Description
I	0	6.5 to 7	FAT CLAY and LEAN CLAY; dark brown, brown, and tan, calcareous, with sand and trace limestone fragments
II	6.5 to 7	10 to 15+	SEVERELY WEATHERED LIMESTONE; tan, consists of interbedded layers of marly clay and broken limestone
III	10	30+	WEATHERED LIMESTONE; tan, fractured, with marly clay seams, some fossiliferous layers (Boring B-1 only)
Strata changes are approximate, and in-situ transitions are usually gradual.			

Geology: Based on the available geologic map¹ of the area, and the contents of the borings, the site is located within the *Walnut Clay Formation*.

The Cretaceous Period Walnut Clay Formation is composed of fossiliferous, thin-bedded clay, limestone, and shale that were deposited in a shallow marine environment. The unweathered clay and shale are gray, and weather to brown, tan, light gray, or yellow. Limestone ranges from chalk to marl, but occasional thin beds consisting of crystalline limestone are present. Fossiliferous limestone layers consisting almost entirely of the oyster *Texigryphaea* are common in the lower part of the formation.

Groundwater: Boring B-1 was drilled to a depth of 15 feet before using water in the rock core drilling process. Groundwater was not observed above that depth at the time of drilling. Groundwater readings are not meaningful after water is introduced into the hole for coring.

Borings B-2 and B-3 were both drilled to a depth of 15 feet using dry drilling methods, meaning water was not used in the drilling process. Groundwater was not observed in the borings at the time of drilling.

Although groundwater was not encountered in the borings during our field exploration, transient groundwater is common in this area, and may be present during construction. The water tends to percolate down through the surficial soils until encountering a relatively impervious layer, and then either flow down gradient or become trapped.

The water observations conducted for this investigation are short-term and should not be interpreted as a groundwater study. However, the presence of groundwater may affect construction and long-term performance of the proposed foundation and pavement.

5.0 GEOTECHNICAL FOUNDATION RECOMMENDATIONS

Project Summary: The project consists of the expansion of an existing Pump Station. It will include a new Standpipe. We understand the Standpipe will have a capacity of about 100,000 gallons and be about 15 feet in diameter.

Expansive Soil: Clay soils in the Central Texas area are subject to expansive soil movements, which include swelling under moist conditions and shrinking under dry conditions. Moisture fluctuations occur due to seasonal wet and dry cycles, but are also influenced after construction by site grading, drainage, landscaping, and groundwater. Actual soil movement is difficult to determine due to the many unpredictable variables involved.

TxDOT uses the Potential Vertical Rise (PVR) procedure to estimate soil movements. For purposes of this project, the results of the laboratory tests, engineering judgment, and experience have also been considered. ***The approximate PVR for a typical ground supported slab will be about 1 to 1½ inches, which is considered low for the Central Texas area.***

Foundation Types: Based on the types of soils encountered in the borings, as well as our understanding of the project, we anticipate that a ringwall foundation in conjunction with removal and replacement of some of the native soils will be used for support for the Standpipe.

RINGWALL ON GRADE

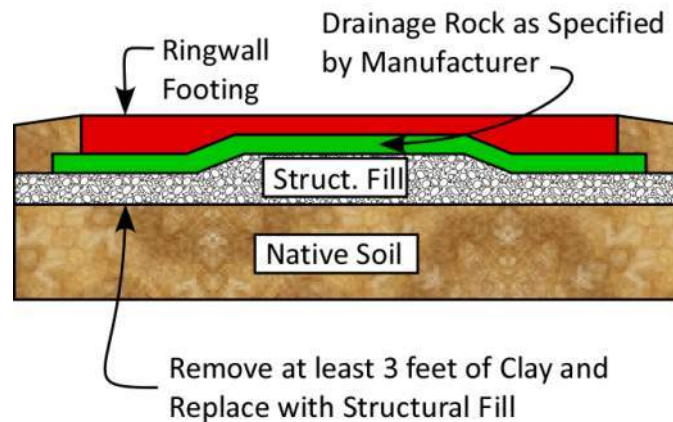


Figure 5.1: Ringwall Footing Sketch (not to scale)

Risk: A properly designed and constructed Ringwall on Grade will offer a low to moderate amount of risk of future foundation movements. Construction of a Ringwall on Grade must be used in conjunction with removal and replacement of the native expansive clay soils with structural fill.

Bearing Stratum: Structural Fill

Bearing Pressure: An allowable bearing pressure of 3,500 psf may be used for a Ringwall foundation supported in Structural Fill. Footings should bear at a depth of at least 24 inches below the final ground surface for lateral stability.

Alternatively, if a greater bearing pressure is needed, it is possible to excavate to a depth of at least 7 feet to Stratum II – Severely Weathered Limestone. If the Ringwall bears on at least 1 foot of Structural Fill that is placed directly on Severely Weathered Limestone, the allowable bearing pressure may be increased to 6,000 psf.

Interior Slab: Remove native clay soils to a depth of at least 3 feet to achieve a PVR of ½ inch and replace with Structural Fill. Structural Fill specifications are contained in Section 6 of this report.

A modulus of subgrade reaction of 200 kcf may be used.

Settlement: The majority of the foundation loading will occur when the tank is initially filled. For this reason, we recommend that the tank be filled to only half capacity for the initial 3 weeks.

A properly designed and constructed Ringwall foundation is expected to have a settlement of 1 inch or less. Differential settlements are anticipated to be $\frac{2}{3}$ of the total settlement or less.

If Structural Fill is placed directly on Severely Weathered Limestone at a depth of at least 7 feet, the anticipated settlement will be $\frac{3}{4}$ inch or less, with differential settlements anticipated to be $\frac{1}{2}$ inch or less.

MISCELLANEOUS DESIGN ITEMS:

Flatwork: This site is on expansive clay soils. Be aware that concrete flatwork such as sidewalks, drainage features, plazas, and utilities will be subject to adverse soil movements. The owner should be prepared to repair and even replace these items over time, depending on the magnitude of movement that actually occurs. Where the ground is intentionally sloped and graded to provide positive drainage, the ground may swell and shrink (or settle) sufficiently over time to reverse the intended drainage, and must be remediated when necessary.

The magnitude of shrink/swell movements can be reduced by placing select fill below items such as sidewalks and approaches to entrances. From a practical standpoint, about 1-ft of select fill will help reduce the effects of the expansive clay soils. Cracks in ground-supported flatwork should be anticipated.

Seismic: For structural designs based upon the 2018 IBC, the following criteria will apply. The Site Class is B. The Mapped Spectral Response Acceleration at short periods (SS) is about 0.08g, and the Mapped Spectral Response Acceleration at a 1 second period (S1) is about 0.04g. Site Coefficients are as follows: $F_a = 0.9$ and $F_v = 0.8$.

Hazards associated with slope stability, soil liquefaction, surface rupture, and lateral spreading are not considered an issue with this site due to the study area being in a seismically inactive area.

Vapor Barriers: The need for vapor barriers, and where to place them, must be determined by the architect or structural engineer based on the proposed floor treatment, building function, concrete properties, placement techniques, code requirements, and the construction schedule. When moisture barriers are used, precautions should be taken during the initial floor slab concrete curing period to reduce differential curing and possible curling of the slabs.

Impervious Seal: We recommend that an impervious seal consisting of at least 12 inches of clay soil be constructed on top of the backfill material around the perimeter. The intent of this impervious seal is to reduce surface runoff water from infiltrating the backfill. The seal must be sloped away from the foundation.

Utility Connections: Utilities resting on or within expansive soils will be subject to soil movements. Utility connections should account for such movement potential, such as using flexible connections.

Based on our previous experience, clay soils are corrosive to buried metals. Corrosion protection should be provided for such metals. If granular backfill materials are used for the utility lines, then a clay plug must be placed at the exterior foundation penetrations to avoid water intrusion and collection within the utility trenches.

Review by MEP: We recommend that this report be provided to the project Mechanical, Electrical, and Plumbing engineers (MEP's). Their designs should account for the estimated soil movement potential. We are available to help with questions they may have about soil movements.

6.0 GEOTECHNICAL CONSTRUCTION RECOMMENDATIONS

Site Preparation: *Surficial vegetation, root systems, existing fill, existing utilities, and underground structures must be removed below the foundations.* The stripping depth must be based on field observations with attention given to old drainage areas, uneven topography, and wet soils.

Where practical, proof-rolling should be used to detect soft spots or pumping subgrade areas. Proof-rolling should be performed using a heavy pneumatic tired roller, loaded dump truck, or similar piece of equipment weighing at least 25 tons.

Grading: Grading, landscaping, and drainage pose a significant risk factor for future performance of the foundation systems. Prevention of water ponding around the foundation is critical. We suggest the following general guidelines for perimeter drainage:

1. The pad or the finished floor elevation must be elevated from the exterior finished grade to assist in draining the surface water away from the structure.
2. Where possible, extend paved surfaces up to the foundation to serve as a barrier to soil moisture evaporation and infiltration. These surfaces must slope away from the structures.
3. Outlets for gutter systems must rapidly discharge water away from the foundation.
4. Roots from trees and decorative vegetation remove moisture from soils, which causes soil shrinkage (settlement). Trees should have root blockers near the foundation or be located as far away from the foundation as practical.
5. Sprinkler systems must be properly maintained and over-watering of the soils should be avoided.

Subgrade: Where practical, the subgrade soils should be compacted to at least 95 percent of ASTM D698 maximum dry density at 0 to +3% of the optimum moisture content. Proof-rolling may be used in lieu of compaction testing of the subgrade, but will require approval by LE on a case-by-case basis. In most cases, compaction testing will be required.

Subgrade

Improvement:

Some of the onsite soils may be subject to pumping of the subgrade, and we should be contacted if this situation occurs. Clean crushed stone may be placed to create a firm working surface. We expect that a layer of about 6 to 8 inches in thickness will be needed if soft and/or wet subgrade conditions are present, but field conditions may dictate an increased thickness. The amount of clean stone will need to be determined during construction, and LE will be available to assist based on the actual field conditions encountered. If more than about 10 inches is used, then a filter fabric or mud slab should be placed on top of the stone to prevent migration of fines.

The crushed stone must be clean and should generally range in size from 3 to 6 inches. Compaction specifications do not apply; however, the stone should be placed in such a manner that will stabilize the subgrade. This type of clean stone is normally used to stabilize construction entrances and should be readily available.

Once a firm base is established, Structural Fill can then be placed.

Structural Fill:

Structural Fill must meet the requirements of 2014 TxDOT Item 247, Type A, Grade 1-2 or better. The material should be compacted to at least 95 percent of ASTM D698 maximum dry density at 0 to +3% of the optimum moisture content. A maximum compacted lift thickness of six inches must be specified, with each lift tested for compliance prior to the addition of subsequent lifts. The placement and compaction of select fill material must be observed, monitored, and tested by LE on a full-time basis.

The tank manufacturer may have other requirements for special materials directly below the slab, such as drainage rock or a specific type of crushed rock. In this case, the tank designer or manufacturer should specify the type of material as well as the compaction specifications.

Foundation:

Foundation construction recommendations are listed below.

1. The foundation construction must be observed by LE to determine that the proper bearing material has been reached in accordance with the recommendations given herein.

2. Prior to the placement of concrete, water must be removed from the foundation excavations. Prolonged exposure or inundation of the bearing surface with water may result in changes in bearing strength and compressibility characteristics. If delays occur, excavations should be deepened and cleaned, in order to provide a fresh bearing surface.
3. Concrete must be placed promptly after the excavations are completed, cleaned, and observed.

7.0 PAVEMENT RECOMMENDATIONS

Pavement: A new access drive will be constructed. We anticipate that some light and medium duty services vehicles will use the access drive. We also anticipate heavy vehicles will rarely use the access drive.

Risk: Pavement design methods are intended to provide an adequate thickness of structural materials over the subgrade to support the wheel loads. Design methods do not account for shrink and swell movements of expansive clays or settlement of poorly compacted fill materials. *The pavement may be adequate from a structural standpoint, yet still experience cracking due to movement of the subgrade.* It is critical to minimize moisture changes in the subgrade to reduce shrink/swell movements.

The pavement and adjacent areas must be well drained. Proper maintenance must be performed on cracks in the pavement surface to prevent water passing through to the base or subbase material. Extending the base material out about 2 feet from the edge of the pavement curb will also aid in reducing edge related cracking. Even with these precautions, some movements and related cracking may still occur. Routine maintenance is essential.

Using lime and/or geogrid will help reduce damage from expansive clay soils, but will usually increase the cost of the initial pavement installation. In the long-term, it has been our experience that using lime and/or geogrid reduces maintenance costs and extends the pavement life.

Pavement “islands” often provide a means of water infiltration into the base and subgrade materials below the pavement. If islands are used, then we recommend that a synthetic lining or clay soils be used to limit infiltration of water into the base and subgrade. Water entry into the base and subgrade will cause softening of the materials, and will cause potholes and/or ruts to form.

The presence of trees and vegetation adjacent to paved areas will exacerbate the formation of cracks in pavements due to moisture loss in the subgrade from transpiration to the root systems of the vegetation. Soil moisture loss from vegetation can extend a distance from the vegetation about equal to its height. *In general, concrete pavements perform better than asphalt pavements on expansive clay.*

Traffic Types: We anticipate that traffic will consist of light vehicles and medium duty vehicles. Tanker trucks, trash trucks and other heavy vehicles will be restricted to designated service areas.

Because exact traffic data were not available for this project, we have made assumptions based on past experience and traffic criteria used for other projects. These estimates should be reviewed by the owner because the traffic information has an impact on the pavement thickness and future performance.

Traffic Loads: For pavement design purposes, traffic volumes are expressed as the number of Equivalent 18-kip single axle load applications (ESAL) over a 20-year theoretical pavement design life. We have summarized values for three primary traffic conditions in Table 7.1.

We have computed the approximate types and volumes of different vehicles to aid in the owner's evaluation of the intended uses of the pavements.

TABLE 7.1: TRAFFIC ESTIMATES			
Traffic Area	Typical Traffic	ESAL's	Reference Table
Light Parking Light Duty	Light cars and pickups, occasional medium delivery trucks, rare heavy vehicles, similar to a low volume residential street.	20,000	Table 7.2A
Access Drive Medium Duty	Light cars and trucks, few heavy vehicles, similar to a moderate volume residential street.	60,000	Table 7.2B
Access Drive Heavy Duty	Heavy service or haul trucks, similar to a moderate to high volume residential street.	100,000	Table 7.2C

TABLE 7.2A: ESTIMATED TRAFFIC CHARACTERISTICS (20,000 ESAL'S – LIGHT DUTY VEHICLE PARKING)		
<i>Vehicle Type</i>	<i>Gross Vehicle Weight (lbs)</i>	<i>Vehicles per Day (per lane)</i>
Cars / Pickups	4,000	2,000
Medium Delivery Trucks	20,000	10
Heavy Trucks	60,000 to 80,000	1 per week

TABLE 7.2B: ESTIMATED TRAFFIC CHARACTERISTICS (60,000 ESAL'S – ACCESS DRIVE)		
<i>Vehicle Type</i>	<i>Gross Vehicle Weight (lbs)</i>	<i>Vehicles per Day (per lane)</i>
Cars / Pickups	4,000	2,000
Medium Delivery Trucks	20,000	20
Heavy Trucks	60,000 to 80,000	1

TABLE 7.2C: ESTIMATED TRAFFIC CHARACTERISTICS (100,000 ESAL'S – ACCESS DRIVE)		
<i>Vehicle Type</i>	<i>Gross Vehicle Weight (lbs)</i>	<i>Vehicles per Day (per lane)</i>
Cars / Pickups	4,000	2,000
Medium Delivery Trucks	20,000	22
Heavy Trucks	60,000 to 80,000	4

Subgrade: Based on the subsurface materials observed at the boring locations, the primary subgrade at this site will be clay. A resilient modulus value of 3,200 psi has been assigned to the subgrade based correlations between soil index properties and resilient modulus values.

Design Method: AASHTO and American Concrete Institute guidelines.

Thickness: Pavement thickness designs are provided in Tables 7.3. A reliability value of 80 percent was assigned to the pavement that corresponds to occasional interruption of traffic for pavement repairs. These designs reflect a theoretical "Design Life" of 20 years.

The "design life" of a pavement is defined as the expected life at the end of which reconstruction of the pavement will need to occur. Normal maintenance, including crack sealing, slurry sealing, and/or chip sealing, should be performed during the life of the pavement.

TABLE 7.3: PAVEMENT THICKNESS OPTIONS

<i>Design Condition</i>	<i>Option</i>	<i>Surface Course</i>	<i>Base Course</i>
Light Vehicle Parking Light Duty 20,000 ESAL	1- Asphalt	1.5" Type C or D	8" CLB and GRID ⁽¹⁾
	2- Asphalt	1.5" Type C or D	6" CLB and 6" LSS ⁽¹⁾
	3- Asphalt	2" Type C or D	10" CLB ⁽²⁾
	4- Concrete ⁽³⁾	5" RCP	6" CLB ⁽¹⁾ or 6" LSS ⁽¹⁾
Access Drive Medium Duty 60,000 ESAL	1- Asphalt	2" Type C or D	9" CLB and GRID ⁽¹⁾
	2- Asphalt	2" Type C or D	6" CLB and 6" LSS ⁽¹⁾
	3- Asphalt	2" Type C or D	13" CLB ⁽²⁾
	4- Concrete ⁽³⁾	5" RCP	6" CLB ⁽¹⁾ or 6" LSS ⁽¹⁾
Access Drive Heavy Duty 100,000 ESAL Concrete is preferred for durability	1- Asphalt	3" Type C or D	8" CLB and GRID ⁽¹⁾
	2- Asphalt	3" Type C or D	6" CLB and 6" LSS ⁽¹⁾
	3- Asphalt	3" Type C or D	12" CLB ⁽²⁾
	4- Concrete ⁽³⁾	6" RCP	6" CLB ⁽¹⁾ or 6" LSS ⁽¹⁾

Type C or D... Hot Mix Asphalt Concrete, TxDOT Type C or D
CLB... Crushed Limestone Base or Crushed Concrete Base
GRID... Tensar TX130S Geogrid
LSS... Lime Stabilized Subgrade
RCP... Reinforced Concrete Pavement

⁽¹⁾Low to Moderate risk of cracking due to expansive soils and random settlement

⁽²⁾Moderate risk of cracking due to expansive soils and random settlement

⁽³⁾It is possible to place concrete pavement directly on the prepared subgrade without base or lime stabilization in conjunction with increasing the concrete thickness by 1 inch. However, doing that will create a higher risk of premature failure of the concrete due to swelling clay soils.

The Heavy Duty section listed above is only for light to moderate truck traffic. For areas with a high volume of truck traffic, we will need project-specific information to determine the pavement thickness.

Site Preparation: Surficial vegetation, trees, root systems, existing fill, existing utilities, and all underground structures must be removed below the new pavement areas. The stripping depth must be based on field observations with attention given to old drainage areas, uneven topography, and wet soils. Where practical, proof-rolling should be used to detect soft spots or pumping subgrade areas. Proof-rolling should be performed using a heavy pneumatic tired roller, loaded dump truck, or similar piece of equipment weighing at least 25 tons.

Lime Stabilized

Subgrade:

Lime Stabilized Subgrade (LSS) is often used in the Central Texas area to reduce the effects of expansive clay soils, and to strengthen the subgrade. Lime stabilization for the pavement is not critical for structural support of the pavement but is recommended due to the presence of clay soils. Lime stabilization will help reduce heave and cracking in the pavement, which will promote a longer service life.

Geogrid:

Geogrid (GRID) acts as reinforcement in asphalt pavement sections to help reduce pavement cracking in existing fill materials. It also allows the use of thinner base sections. Geogrid may not completely prevent cracking in the pavement, but it will help to reduce cracking, especially linear cracking.

Subgrade

Improvement:

Some of the onsite soils will be subject to pumping of the subgrade, and we should be contacted if this situation occurs. Clean crushed stone may be placed at the base of the excavations to create a firm working surface where needed and/or specified. We expect that a layer of about 6 to 8 inches in thickness will be needed if soft and/or wet subgrade conditions are present, but field conditions may dictate an increased thickness. If more than about 10 inches is needed, then a filter fabric may be needed to avoid migration of fines.

The crushed stone must be clean, and should generally range in size from 3 to 6 inches. Compaction specifications do not apply; however, the stone should be placed in such a manner that will stabilize the bottom of the excavations. This type of clean stone is normally used to stabilize construction entrances, and should be readily available. Be aware that plumbing and other features that require trenching will be difficult to install if the trenches extend into the clean stone.

Specifications:

Pavement specifications. The TxDOT citations below reference the 2014 Edition unless stated otherwise.

1. Hot Mix Asphalt Concrete (HMAC): TxDOT Item 340, Type C or D.
2. Crushed Limestone Base or Crushed Concrete Base (CLB): TxDOT Item 247, Type A or D, Grade 1-2 (or 2004 TxDOT Grade 2). Compact to at least 95% of ASTM D1557 (or 100% of TEX-113) at a moisture content range of 0 to +3% of optimum moisture content in 6-inch compacted lifts.
3. Lime Stabilized Subgrade (LSS): TxDOT Item 260, with a lime solids application rate of 6% by dry soil unit weight. This will result in an

application of approximately 28 pounds of lime per square yard for a 6-inch lift.

The LSS should be compacted in a 6-inch compacted thickness to at least 95% of ASTM D698 (or TEX-113-E) maximum dry density within 0% to +4% of optimum moisture content. Only lime in the liquid form or pellet form should be used to avoid harmful dust generation. Depth checks must be performed to verify that lime does not extend below 6 inches. *The contractor must be aware that lime stabilizing more than 6" will result in dilution of the percentage of lime. It is better to slightly undercut than to overcut.*

4. Reinforced Concrete Pavement (RCP): TxDOT Item 360, Concrete Pavement. The concrete class should be specified as Class P in accordance with TxDOT Item 421, Portland Cement Concrete. TxDOT requires a strength of 4,000 psi at 28 days, along with other requirements in the specification. When sawcut joints are used, the cuts must be made within a few hours of concrete placement. *Sawcuts must not be delayed to the following day.*
5. Geogrid: Tensar TX130S installed according to the manufacturer's recommendations.
6. Subgrade: Scarify and re-compact the existing subgrade to at least 95% of ASTM D698 (or TEX-113-E) maximum dry density at a moisture content range of 0% to +3% of optimum moisture content. This does not apply if lime stabilization is used.
7. Transitions: Transitions from an asphalt pavement to a rigid pavement are often problematic in that over time a depression usually forms in the asphalt at the joint. This is caused when vehicle tires pass from the rigid concrete pavement to the flexible asphalt pavement. One method to reduce this effect is to continue a "lip" of concrete under the asphalt.
8. Drainage: The pavement must have positive drainage, and water must not pond in areas directly adjoining paved sections. Excess watering with sprinkler systems near the pavement should be avoided.

8.0 DESIGN REVIEW AND LIMITATIONS

Design Review: The recommendations contained in this report were based on preliminary site plans and design information provided by the Client. Our recommendations may not be applicable if changes have been made to the original information that formed the basis for this report, and we must be retained to make a determination if changes have been made. We also must be given the opportunity to review construction documents to affirm that our recommendations have been interpreted correctly. We cannot be responsible for misinterpretations if not given the opportunity to review aspects of the project that are based on the contents of this report. Such a review is considered an additional service.

Limitations: This report has been prepared for the exclusive use of our client and their designated project design team. Preparation of the report has been performed using that degree of care and skill ordinarily exercised under similar conditions by reputable geotechnical engineers practicing in the same locality. No warranties, express or implied, are intended or made.

As stated in the attachment “Important Information about Your Geotechnical Engineering Report”, the subsurface conditions are interpreted from samples taken only at the boring locations. During construction, variations will be encountered, and will require interpretation by LE to verify the adequacy of the geotechnical recommendations. Other concerns and limitations are discussed in the attachment.

This investigation did not include environmental testing or evaluations, and does not address whether landfilling operations, as defined by the State of Texas, have occurred on the property. An environmental professional should be retained to address environmental issues.

9.0 REFERENCES

1. Geologic Atlas of Texas, Austin Sheet, Bureau of Economic Geology, The University of Texas at Austin, Austin, Texas 1974.

APPENDIX

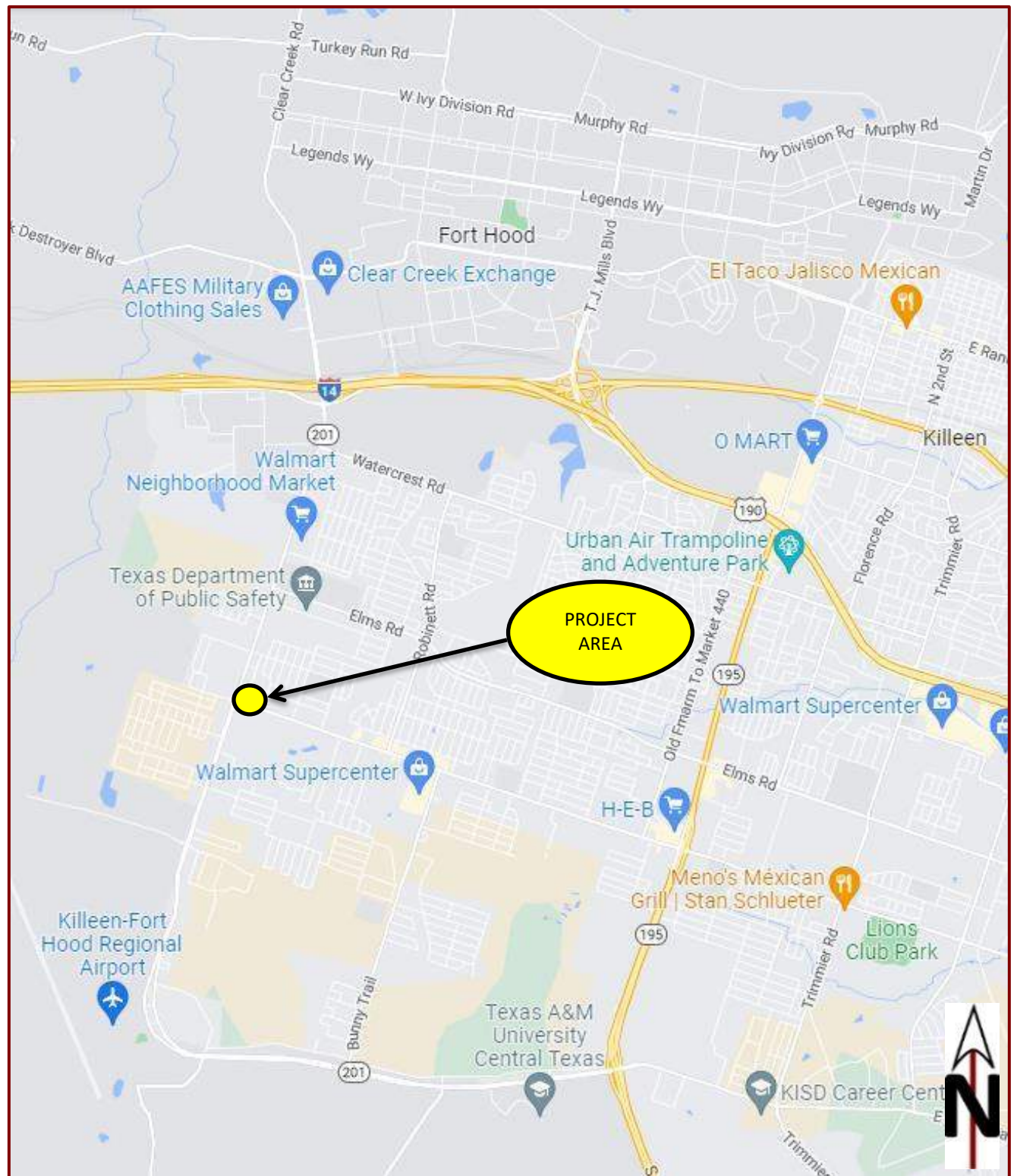
Site Location Map

Boring Location Sketch

Laboratory Test Results

Boring Logs

Important Information about Your Geotechnical Engineering Report



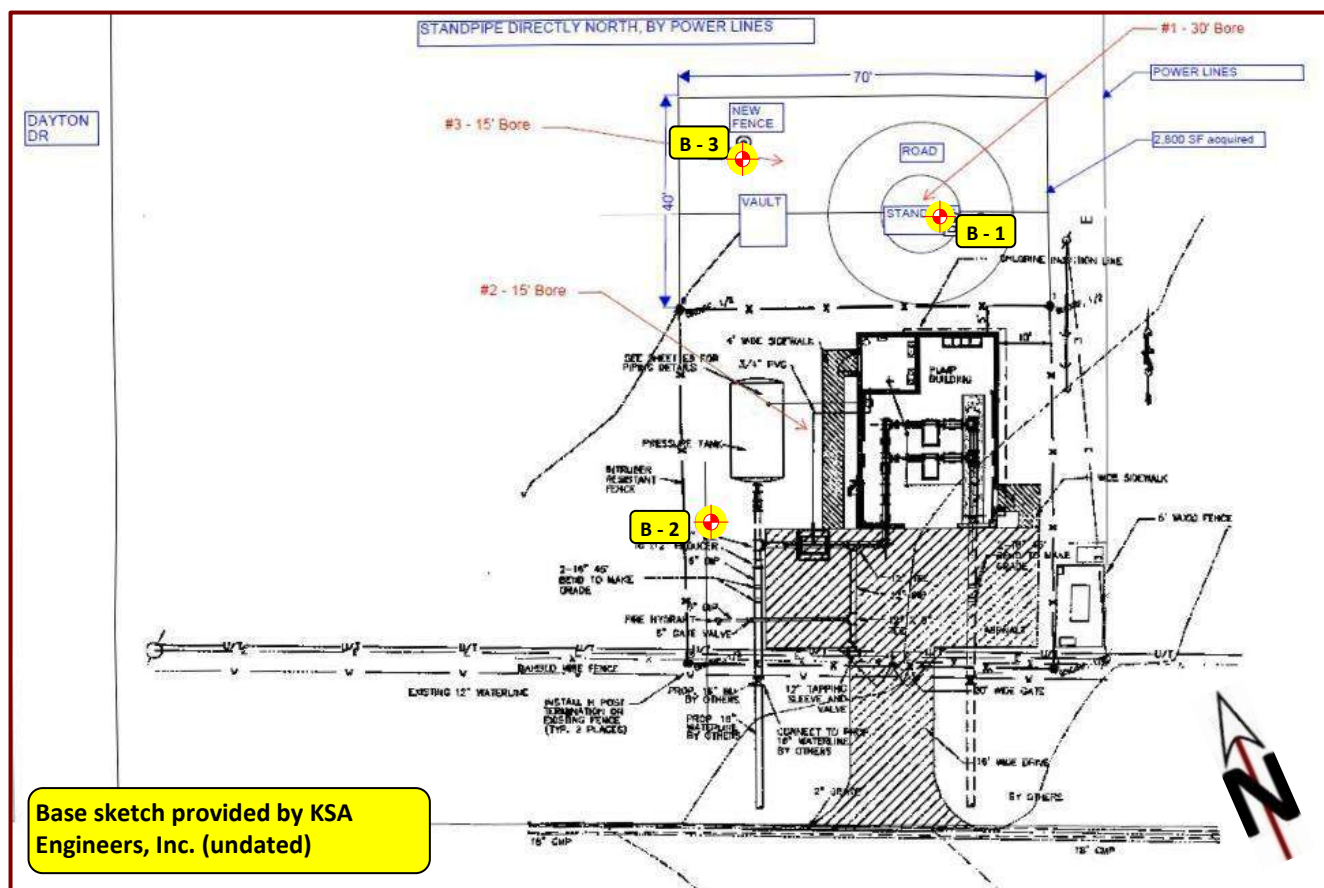
**LANGERMAN
ENGINEERING**

SITE LOCATION MAP

PUMP STATION STANDPIPE
KILLEEN, TEXAS
LE PROJECT NO. W22-083

PLATE

1



**LANGERMAN
ENGINEERING**

BORING LOCATION MAP

PUMP STATION STANDPIPE
KILLEEN, TEXAS
LE PROJECT NO. W22-083

PLATE

2

Boring No.	Sample Depth (ft.)	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Moisture Content (%)	Unit Dry Weight (pcf)	Unconfined Compressive Strength (tsf)	Strain at Failure (%)
B-1	0.0 - 2.0	52	20	32	78	24			
B-1	2.0 - 4.0				88	16	107.8	13.6	2.3
B-1	4.0 - 6.0	37	16	21	90	10			
B-1	17.5 -							52.1	1.2
B-1	20.1 -							18.3	1.6
B-1	23.8 -							8.8	1.6
B-1	28.9 -							4.1	1.4
B-2	0.0 - 2.0					20	102.3	2.2	4.9
B-2	2.0 - 4.0	32	16	16	89	9			
B-2	4.5 - 6.0	32	17	15	88	27			
B-3	0.0 - 2.0	59	22	37	96	17			
B-3	4.5 - 6.0	27	15	12	89	10			
B-3	10.5 - 11.5	28	15	13	89	14			



**LANGERMAN
ENGINEERING**

Summary of Laboratory Results

Project: Pump Station Standpipe

Project Number: W22-083



Langerman Engineering
Waco and Harker Heights (Killeen), Texas
Ph: 254-235-1048 www.LFECTX.com

BORING NO. B-1

PAGE 1 OF 1

CLIENT KSA Engineers, Inc.

PROJECT NAME Pump Station Standpipe

PROJECT NUMBER W22-083

PROJECT LOCATION Killeen, TX

LANGERMAN FOSTER - GINT STD US LAB.GDT - 12/15/22 15:57 - Z:\GINT PROJECTS\W22-083, PUMP STATION STANDPIPE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ATTERBERG LIMITS			FINES CONTENT (%)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	STRAIN AT FAILURE (%)
0		Approximate Surface Elevation feet												
		FAT CLAY; brown, with sand	ST			2.	52	20	32	78	24			
		FAT CLAY; brown, calcareous	ST			4.5+				88	16	108	13.6	2.3
5		LEAN CLAY; tan, trace limestone fragments	ST				37	16	21	90	10			
		SEVERELY WEATHERED LIMESTONE; tan, consists of interbedded layers of marly clay and broken limestone	SS		11-14- 50/6"									
			A											
			SS		50/5"									
			A											
10		WEATHERED LIMESTONE; tan, fractured, with marly clay seams	SS		50/3"									
			A											
			SS		50/4"									
			A											
15			RC	94 (64)									52.1	1.2
20			RC	100 (83)									18.3	1.6
25			RC	97 (77)									8.8	1.6
30		--- fossiliferous layer at about 28.5 feet --- tan and gray											4.1	1.4

Completion Depth: 30 ft.
Date Started: 11/17/22
Completed: 11/17/22
Logged by: L. Fleischhauer

Remarks: Boring was advanced to a depth of 15 feet before using water in the rock core drilling process. Groundwater was not observed above that depth.



Langerman Engineering
Waco and Harker Heights (Killeen), Texas
Ph: 254-235-1048 www.LFECTX.com

BORING NO. B-2

PAGE 1 OF 1

CLIENT KSA Engineers, Inc.

PROJECT NAME Pump Station Standpipe

PROJECT NUMBER W22-083

PROJECT LOCATION Killeen, TX

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ATTERBERG LIMITS			FINES CONTENT (%)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	STRAIN AT FAILURE (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX					
0		Approximate Surface Elevation feet												
		FAT CLAY; dark brown	ST			4.5					20	102	2.2	4.9
		LEAN CLAY; tan	ST			4.5	32	16	16	89	9			
5		SEVERELY WEATHERED LIMESTONE; tan, consists of interbedded layers of marly clay and broken limestone	A											
			SS		6-12-13 (25)		32	17	15	88	27			
			A		50/4"									
			SS		50/5"									
10			A											
			SS		50/3"									
		--- limestone layer at about 10.5 feet	A											
			SS		50/5"									
15			A											

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Completion Depth: 15 ft.
Date Started: 11/17/22
Completed: 11/17/22
Logged by: L. Fleischhauer

Remarks: Boring was advanced to a depth of 15 feet using dry drilling techniques.
Groundwater was not observed above that depth.



Langerman Engineering
Waco and Harker Heights (Killeen), Texas
Ph: 254-235-1048 www.LFECTX.com

BORING NO. B-3

PAGE 1 OF 1

CLIENT KSA Engineers, Inc.

PROJECT NAME Pump Station Standpipe

PROJECT NUMBER W22-083

PROJECT LOCATION Killeen, TX

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ATTERBERG LIMITS			FINES CONTENT (%)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	STRAIN AT FAILURE (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX					
0		Approximate Surface Elevation feet												
		FAT CLAY; brown	ST			3.0	59	22	37	96	17			
		LEAN CLAY; tan	SS		13-12-11 (23)									
			A											
5			SS		9-9-12 (21)		27	15	12	89	10			
			A											
		SEVERELY WEATHERED LIMESTONE; tan, consists of interbedded layers of marly clay and broken limestone	SS		19-33-45 (78)									
			A											
10			SS		20-38- 50/5"									
			A											
			SS		33-50/6"		28	15	13	89	14			
			A											
			SS		50/5"									
15			A											

LANGERMAN FOSTER - GINT STD US LAB.GDT - 12/15/22 15:57 - Z:\GINT PROJECTS\W22-083, PUMP STATION STANDPIPE.GPJ

Completion Depth: 15 ft.
Date Started: 11/17/22
Completed: 11/17/22
Logged by: L. Fleischhauer

Remarks: Boring was advanced to a depth of 15 feet using dry drilling techniques.
Groundwater was not observed above that depth.

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual site-wide subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you’ve included the material for information purposes only. To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists.*



**GEOPROFESSIONAL
BUSINESS
ASSOCIATION**

Telephone: 301/565-2733

e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX B

Geotechnical Construction Testing and Observation (Allowance)

- Concrete Testing,**
- Reinforcing Steel Observation**



**LANGERMAN FOSTER
ENGINEERING COMPANY**

March 2, 2023

KSA Engineers, Inc.
Attn: Mr. Salvatore Pellittieri
4833 Spicewood Springs, Suite 204
Austin, Texas 78759

Ph# 512/342-6868 ext. 2202

Email: SPellittieri@KSAEng.com

Reference: Construction Materials Testing Proposal
100,000 Gallon Ground Stand Pipe Water Storage Tank-Killeen, Texas
LFE Proposal No. CMT23-038

We are pleased to present this proposal for construction materials testing services for the 100,000 Gallon Ground Stand Pipe Water Storage Tank in Killeen, Texas. Our understanding is that the scope of services for the project includes soils testing, concrete/CTB testing, and HMAC testing. Structural steel services are not included in the scope of services.

The attached Fee Schedule is applicable for the proposed work, and will be in effect for the duration of the project. This assumes that the project commences within 6 months of the date of this proposal. The total cost of testing services will depend on the efficiency of the contractor. The cost does not include re-tests and assumes construction practices that LFE has found to be common in the Central Texas area. We respectfully suggest that the Client review the attached estimate for general conformance with their understanding and expectation of the CMT requirements.

The following bid for the referenced project is based on a general review of the plans and specifications provided:

- ***Bid: \$8,695.00***

If this proposal meets with your expectations, please sign and date in the space at the end of the Agreement and return a copy for our files. In the absence of Client's signature, Client agrees that oral acceptance and/or Client's initiation of services constitutes formal acceptance of all terms and conditions of this proposal and Agreement. We look forward to working with you on these projects.

Best Regards,
LANGERMAN FOSTER ENGINEERING COMPANY
Texas Registered Engineering Firm No. F-13144

Ronnie Poston

Ronnie Poston
Project Manager
Attachments: Fee Schedule, Basis for Charges, Estimate

SCOPE OF SERVICES

100,000 GALLON STAND PIPE WATER STORAGE TANK

KILLEEN, TEXAS

General: Langerman Foster (LFE) will provide construction materials testing and special observation services as described below for the above project on an "as called or full time basis" as required. For this purpose, we agree to provide a technician to conduct tests in the field and/or to sample materials at the direction of the client or his designated representative, and to deliver those samples to our laboratory for testing. It is the responsibility of the general contractor to determine the tests that are required, by specifications, for the project and to provide proper notice to schedule our technician.

LFE is not managing the testing for this project and is not providing construction materials engineering services.

Testing Services: Included in our understanding of the workscope are the following duties of our field and laboratory staff:

1. Compaction testing of subgrade, structural fill, lime stabilized subgrade, and base

- a. Sample subgrade, structural fill, lime stabilized subgrade, and base, and deliver to LFE laboratory for reference tests as listed below.
 - Moisture Density Curves
 - Atterberg Limits Tests
 - Material Gradations
 - Wet Ball Mill Tests
- b. Provide part time observation of compaction operations and take field nuclear density tests to verify compaction.
- c. Prepare report of test results.

2. Concrete strength and consistency tests

- a. Sample concrete and test for the following:
 - Slump
 - Temperature
 - Air Content (if required)
 - Unit Weight (if required)
- b. Sample concrete and prepare strength specimens.
- c. Cure test strength specimens and conduct compression strength tests.
- d. Prepare report of test results.

3. Hot Mix Asphaltic Concrete

- a. Sample hot mix and mold specimens for bulk stability.
- b. Perform extractions and gradations of hot mix aggregates.
- c. Obtain HMAC cores for thickness and density determination.
- d. Prepare report of observations and tests.

LFE provides additional services, and costs for those services will be supplied upon request.

**CMT FEE SCHEDULE AND BASIS OF CHARGES
(OCTOBER 1, 2022)**

PROFESSIONAL STAFF RATES

Senior Engineer (PE)	\$200 / hour
Engineer (PE).....	\$170 / hour
Engineer-in-Training (EIT)	\$130 / hour
Structural Steel Technician	110 / hour
Supervisory Technician	85 / hour
Field Technician	65 / hour
Administrative/Word Processor	65 / hour

CONSTRUCTION MATERIALS TESTING SERVICES

Soil Moisture Content	15 / each
Sieve Analysis	125 / each
#200 Sieve Only.....	45 / each
Air Content (when no cylinders are made).....	40 / each
Concrete Slump (when no cylinders are made).....	30 / each
Concrete cylinders w/slump and air (if required) plus technician time	27 / each
Flexural Beam Tests, w/slump and air (if required) plus technician time	45 / each
Concrete Unit Weight	40 / each
Atterberg Limits	125 / each
Moisture-Density Relations	
- ASTM D698*	300 / each
- ASTM D1557*	300 / each
- TEX-113-E*	375 / each
- TEX-114-E*, PI>20	375 / each
Field Density Tests	
- Nuclear Method, per test (Minimum 3) plus technician time	27 / each
Wet Ball Mill (TEX 115E)*.....	315 / each
Lime Series (ASTM D6276)*	220 / each
HMAC Gradation from Extraction.....	110 / each
HMAC Asphalt Content by Extraction	225 / each
HMAC Specimen Molding	125 / each
HMAC Bulk Density of Compacted Specimen	85 / each
HMAC Maximum Theoretical Specific Gravity	80 / each
Fireproofing Adhesion	35 / each
Fireproofing Density	35 / each
Vehicle Fee (per round trip to local jobsite)	50 / each
- Mileage outside of Waco, Temple, Belton, and Killeen city limits	50 + 0.65 / mile
Vehicle Fee for Steel Services (from Austin).....	175 / each
Report Fee (per each report issued)	25 / each

Quotes for other tests upon request

*These tests usually require companion tests and services such as Atterberg Limits and gradation testing, which are additional costs.

BASIS OF CHARGES
(OCTOBER 1, 2022)

1. Prices listed are for services most frequently performed. Prices for other services provided by the firm or other services not listed will be given upon request, as well as special quotations for programs involving volume work.
2. Invoices will be issued on a periodic basis, or upon completion of a project, whichever is sooner. The net cash amount of this invoice is payable on presentation of the invoice.
3. A two-hour minimum charge will be made for all field services, portal to portal.
4. A fee of \$25 applies for each test report issued. Reports will be issued via e-mail. If hard copy reports are requested via US mail, then additional charges will apply.
5. Time worked in excess of 8 hours per day, before 7 am or after 5 pm, or weekend/holiday work will be charged at 1.5 times the hourly and unit rates.
6. Per diem will be charged at a rate of \$300 per day per person or expenses plus 20%, whichever is greater. Per diem will be charged for all projects in excess of 50 miles from Waco if overnight stays are required.
7. Outside services will include a 20% markup unless otherwise noted.
8. All samples will be disposed at the completion of the test unless prior arrangements are made. LFE does not accept environmental or contaminated samples.
9. A vehicle fee of \$50 per trip will be applicable within the city limits of Temple/Belton/Killeen and Waco. An additional charge of \$0.65 per mile will apply outside of the city limits.

Construction Materials Fee Estimate							
100,000 Gallon Stand Pipe Water Storage Tank							
Killeen, Texas							
Description			Quantity		Unit		Charge
Earthwork							
	Nuclear Field Density (min3/trip)		30		\$27.00		\$810.00
	Soil Technician		28		\$65.00		\$1,820.00
	D698 or D1557 Proctor		4		\$300.00		\$1,200.00
	Atterberg Limits		4		\$125.00		\$500.00
	Sieve Analysis		2		\$125.00		\$250.00
	(-) 200 Sieve Wash Test		1		\$45.00		\$45.00
	Wet Ball Mill		2		\$125.00		\$250.00
	In Place Gradation		1		\$45.00		\$45.00
	Lime Depth Checks		3		\$15.00		\$45.00
Concrete							
	Reinforcing Steel Observation		2		\$65.00		\$130.00
	Concrete Technician		4		\$65.00		\$260.00
	Compression Test Cylinders		10		\$27.00		\$270.00
	Cylinder Pick-Up		2		\$65.00		\$130.00
HMAC							
	HMAC Technician		6		\$65.00		\$390.00
	Extraction/Gradation		1		\$335.00		\$335.00
	Molding/Bulk Density Superpave Mix		2		\$210.00		\$420.00
	Rice Gravity		1		\$80.00		\$80.00
	HMAC Cores		2		\$70.00		\$140.00
	Coring Machine/Generator per day		0.5		\$150.00		\$75.00
Vehicle and Report Charges							
	Vehicle Use Fee		20		\$50.00		\$1,000.00
	Report Charge		20		\$25.00		\$500.00
TOTAL:							\$8,695.00

Professional Services Agreement

This agreement is between Langerman Foster Engineering Company, LLC (hereafter termed CONSULTANT) and the undersigned Company, or individual person if not a company (hereafter termed CLIENT). CLIENT employs CONSULTANT to provide engineering and related services in connection with the CLIENT's project, described as follows and hereinafter referred to as THE PROJECT.

Project Description:

100,000 STAND PIPE WATER STORAGE TANK IN KILLEEN, TEXAS, as described in LFE Proposal No. CMT23-038, March 2, 2023

Services shall be provided in general accordance with the accompanying proposal, which is part of this Agreement.

1.0 SERVICES. CONSULTANT WILL:

- 1.1 Endeavor to act for CLIENT using that degree of care and skill (standard of care) ordinarily exercised by competent engineering consultants practicing in the same or similar locality of THE PROJECT site.
- 1.2 Perform the proposed services under the general direction of a licensed Professional Engineer.
- 1.3 Provide written reports in electronic format only. Additional hardcopy reports may be provided upon request at negotiated cost.
- 1.4 Retain pertinent records relating to the services performed for five years following submission of the report, during which period the records can be made available upon request to CLIENT during normal office hours.
- 1.5 Be responsible for the safe conduct only of CONSULTANT's employees on the site, but not for the safe conduct or safety of any others.
- 1.6 Retain samples for a period of no longer than 30 days after issuing any document that includes the data obtained from the samples.
- 1.7 Contact the Texas 811 system for utility locations; however, be aware that the Texas 811 system only locates buried utilities within existing public easements and right-of-ways. All private on-site utilities such as irrigation lines, fire lines, electric lines, gas lines, and any other underground features (if any) must be located at the site and clearly marked by CLIENT. We can provide names of private utility locaters that CLIENT can retain directly for these services. CONSULTANT will not be responsible for damages to any underground utilities that are not located and clearly marked at the site by CLIENT.

2.0 CLIENT'S RESPONSIBILITIES. CLIENT WILL:

- 2.1 Provide CONSULTANT full information regarding the project for the proper performance of CONSULTANT, including hardcopies or electronic copies of the most recent plans and specifications, addenda, change orders, and other such information.
- 2.2 Furnish right of entry onto THE PROJECT site for CONSULTANT or CONSULTANT'S representatives to provide CONSULTANT's services.
- 2.3 Inform the CONSULTANT of the presence or suspected presence of hazardous materials, agreeing to the conditions set forth in 7.1 through 7.4 herein.
- 2.4 Promptly inform CONSULTANT of any actual or suspected defects in CONSULTANT's services, to help CONSULTANT take corrective measures that in CONSULTANT's opinion will help minimize the consequences of any such defect.
- 2.5 Use the research methods agreed to by the American Society of Civil Engineers, American Institute of Architects, and others as published in the document Recommended Practice for Design Professionals Engages as Experts in the Resolution of Construction Industry Disputes to define the Standard of Care referenced in 1.1.
- 2.6 Be responsible for jobsite safety, except CONSULTANT shall be responsible for safety of CONSULTANT's employees.
- 2.7 Be responsible for all permits and approvals necessary for CONSULTANT'S services, unless CONSULTANT assumes this responsibility in the Proposal.

3.0 GENERAL CONDITIONS:

- 3.1 By the performance of the herein described services, CONSULTANT does not in any way assume, change, or abrogate any of those duties, responsibilities or authorities with regard to THE PROJECT customarily vested in THE PROJECT architects, design engineers, or other design agencies or authorities.
- 3.2 CONSULTANT is not responsible for acts or omissions of other parties involved in THE PROJECT or the failure of any contractor or subcontractor to construct any item of THE PROJECT in accordance with the CONSULTANT's recommendations.
- 3.3 This Agreement may be terminated by either party upon receipt of written notice by the other party or by mutual agreement. CONSULTANT shall be paid in full for services performed to the termination date, including services required to properly terminate CONSULTANT's project involvement. CLIENT can be provided, upon request and for appropriate compensation, a report of services completed prior to termination.
- 3.4 Neither CLIENT nor CONSULTANT may transfer duties or interest in the Agreement without the written consent of the other party.
- 3.5 If during the course of the performance of this agreement, conditions or circumstances are discovered, which were not contemplated by CONSULTANT at the commencement of this agreement, CONSULTANT shall notify CLIENT of the newly discovered conditions or circumstances and CLIENT and CONSULTANT shall renegotiate, in good faith, the terms and conditions of this Agreement. If amended terms and conditions cannot be agreed upon within thirty (30) days after notice, CONSULTANT may terminate this Agreement and CONSULTANT shall be paid for its services through the date of termination.
- 3.6 Neither party shall be liable for failure to fulfill its obligations if affected by causes beyond its control, such as Force Majeure. Force Majeure includes, but is not limited to, acts of God; acts of legislative, administrative, or judicial entity; acts of CLIENT'S separate contractors and consultants; wars; fires; floods; labor disturbances; and unusually severe or unanticipated weather.

4.0 CONSIDERATIONS FOR GEOTECHNICAL ENGINEERING SERVICES:

- 4.1 CLIENT shall provide CONSULTANT full information regarding the structure(s) to be constructed on THE PROJECT site, magnitudes and configurations of foundation loads, permissible settlements, planned cuts and fills, proximity to adjacent structures, and other information for the proper performance of CONSULTANT.
- 4.2 Be aware that heavy equipment will likely be used to conduct the field operations and that such equipment use generally results in some alteration of existing conditions. CLIENT agrees to hold harmless CONSULTANT for such alteration. CONSULTANT will attempt to limit such alteration but will not restore the site to its original condition unless a separate agreement is made for such restoration at additional cost prior to such alteration.
- 4.3 CLIENT shall be responsible for locating buried utilities and other man-made objects, furnishing CONSULTANT with this information, approving the subsurface penetration locations with respect to such information, and for the consequences of such being damaged during CONSULTANT's subsurface investigations whenever the location of the damaged structures was not identified with sufficient accuracy for the CONSULTANT. Further, CLIENT agrees to protect and defend CONSULTANT from any claim or liability arising from such damage, including compensating CONSULTANT for time and expenses incurred in defense of such claim. Although CONSULTANT shall notify authorities as required by law before penetrating the ground to reduce the chance of encountering manmade objects below ground, and shall penetrate the ground only at locations indicated by others as free of man-made objects, subsurface objects may still be encountered and even damaged.
- 4.4 CLIENT understands that the education, experience, expertise, and capabilities of those who provide geotechnical engineering services and those who provide geo-environmental services differ significantly. Those involved with a geotechnical engineering project may not notice indications of environmental concerns, and if they do, they may not report them. Accordingly, CLIENT shall, to the fullest extent permitted by law, waive any claim against CONSULTANT and indemnify, defend, and hold CONSULTANT harmless from any claim or liability for injury or loss arising from CONSULTANT'S alleged failure to report or report fully on environmental issues in instruments of geotechnical services. CLIENT also shall compensate CONSULTANT for any time spent or expenses incurred by CONSULTANT in defense of any such claim. Such compensation shall be based upon CONSULTANT'S prevailing fee schedule and expense reimbursement procedures. The term "any claim" used in this provision means "any claim in contract, tort, or statute alleging negligence, errors, omissions, strict liability, statutory liability, breach of contract, breach of warranty, negligent misrepresentation, or other acts giving rise to liability."

5.0 INSURANCE AND LIMITATION OF LIABILITY:

- 5.1 CONSULTANT shall have insurance to protect CONSULTANT from claims against CONSULTANT for accidental bodily injury, death or property damage as may arise from the performance of services made under this agreement. CONSULTANT will provide proof of such insurance to CLIENT upon CLIENT's request.
- 5.2 To the fullest extent permitted by law, the total liability of CONSULTANT arising out of or related to this Agreement, whether based in contract or tort, shall be limited to \$50,000 or the amount of compensation received for services, whichever is greater. This limitation of liability shall apply to any and all claims, no matter how pleaded, including but not limited to, claims for errors and omissions, breach of contract, negligence, or breach of fiduciary duty and applies to all phases of services performed under this Agreement. Greater amounts of coverage can be provided at additional cost to be negotiated with the CLIENT and agreed to in writing. CLIENT agrees this limitation of liability extends to those individuals and organizations CONSULTANT retains for execution of its services, including CONSULTANT's officers, employees, their heirs and assigns, agents, subconsultants, and subcontractors.
- 5.3 CLIENT agrees that any claim for damages filed against CONSULTANT will be filed solely against CONSULTANT or its successors or assigns, and that no individual person shall be made personally liable for damages, in whole or in part.
- 5.4 Neither party shall be responsible to the other for any special, incidental, indirect, exemplary, punitive, penal, nor consequential damages (including lost profits) incurred by either CONSULTANT or CLIENT or for which either party may be liable to any third party.

6.0 CONFIDENTIALITY:

- 6.1 All reports and/or information derived as part of CONSULTANT's services are and shall remain the property of the CONSULTANT.
- 6.2 The CONSULTANT agrees to consider all reports confidential, and will distribute reports only to those persons or entities so directed by the CLIENT with the exceptions noted in Article 6.3 and 6.4.
- 6.3 Any information derived as part of CONSULTANT's services may be released to government authorities when a public safety hazard is perceived to exist, when required by law, and to the necessary parties when CONSULTANT must protect itself from civil claims.
- 6.4 Information obtained from CONSULTANT's services may be used by CONSULTANT for technical studies and presentations intended to advance the art and science of engineering, while preserving CLIENT confidentiality.
- 6.5 The CONSULTANT's reports, findings, and recommendations are for the CLIENT'S sole use and shall not be transferred or sold to others without the knowledge and consent of the CONSULTANT.

7.0 UNANTICIPATED HAZARDOUS MATERIALS AND CONDITIONS:

- 7.1 The CLIENT understands that hazardous materials or conditions on or beneath the surface of a site create extraordinary risks for CONSULTANT including the need for precautions to protect the health and safety of its personnel and to comply with applicable laws and regulations.
- 7.2 CLIENT agrees that the notification to CONSULTANT of known or the discovery by CONSULTANT of unanticipated, hazardous materials or conditions constitutes a changed condition mandating a renegotiation of the scope of work for THE PROJECT or termination of services.
- 7.3 The discovery of unanticipated hazardous materials or conditions may result in a significant reduction of the CLIENT's property value or the OWNER's value if THE PROJECT site is owned by others. Since the CONSULTANT is in no way responsible for the presence of these unanticipated materials or conditions, CLIENT agrees to waive any claim against CONSULTANT and agrees to defend, indemnify, and hold harmless CONSULTANT from any claim or liability for injury, loss, or damages arising from the referenced discovery.
- 7.4 CLIENT agrees to pay CONSULTANT for costs incurred by CONSULTANT related to encountering unanticipated hazardous materials and conditions.

8.0 PAYMENT:

- 8.1 Invoices will be provided in electronic format based on the proposal and/or attached fee schedule. Invoices will be presented at the project completion or monthly and are due in full upon receipt. Invoices are past due net 15 days. CONSULTANT shall be notified within 15 days of receiving an invoice if CLIENT disputes the invoice, but CLIENT shall pay the portion of the invoice that is not in dispute within the usual time frame. CLIENT agrees to pay CONSULTANT late charges of one and one-half (1½) percent per month, or up to the legal limit if less, on the unpaid balance.
- 8.2 CLIENT agrees that invoices will be paid without requiring any other signings, documents, or representations except for the reports stated in Article 1.3, unless agreed to in writing prior to CONSULTANT providing services.
- 8.3 CLIENT agrees to pay CONSULTANT regardless of whether CLIENT is expecting, has received, or has not received payment from others for the Project.

9.0 EXTENT OF AGREEMENT AND APPLICABLE LAW:

- 9.1 The Agreement, including these terms and conditions, represents the entire agreement between CLIENT and CONSULTANT and supersedes all prior negotiations, representations, or agreements, written or oral. The agreement may be amended only by written instrument signed by CLIENT and CONSULTANT.
- 9.2 The Agreement shall be governed by the laws of the State of Texas. Any disputes arising from this agreement shall be performed in McLennan County, Texas and the CLIENT agrees to waive the right to sue elsewhere.
- 9.3 If any part of this Agreement is deemed invalid in a court of law or otherwise, all remaining parts shall remain in force.
- 9.4 Unless previously accepted in writing, this Agreement is withdrawn automatically on the 30th day after issue, but may be accepted thereafter by CONSULTANT at its discretion.

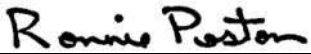
This agreement is entered into by the undersigned on behalf of the company noted, or in the case of a CLIENT who is an individual, then by the signature of that individual. When signing for a company, the person signing below attests that they are authorized to act on behalf of that Company.

PROJECT: 100,000 GALLON STAND PIPE WATER STORAGE TANK IN KILLEEN, TEXAS, CMT23-038

CLIENT: KSA ENGINEERS, INC.

Client Representative Name and Phone:	
Signature:	Date:
Title:	
Client Company Name (full legal name):	
Email Address for Receiving Reports, Invoices, and other Communications:	
Physical Address:	

CONSULTANT: LANGERMAN FOSTER ENGINEERING COMPANY, LLC

Printed Name: Ronnie W. Poston	
Signature: 	Date: March 2, 2023

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APPENDIX C

Additional Construction Inspection (Contracted Directly by Owner)

- Welding Inspection,**
- Fabrication Inspection,**
- Erection inspection,**
- Sandblasting Inspection, and**
- Coating Inspection**



HOT Inspection Services, Inc.

Tank Consultants and Inspection Specialists

P.O. Box 1208 • Round Rock, Texas 78680

PROPOSAL FOR SERVICES

HOT Inspection Services, Inc. (HOT) hereby offers to perform the following work on the Killeen Standpipe Tank. The tank being a new **100,000-gallon (15'Ø x 80' tall) Standpipe Water Tank Project** at the price, terms, and conditions listed herein. As a team member of the project, HOT Inspection agrees to work with the project team in a collaborative effort in obtaining a quality product during the construction of the referenced water tank.

CONSTRUCTION PHASE

1. Conduct on site visits to provide Quality Assurance Surveillance and observe the progress and quality of the executed work in accordance with the Contract Documents. In performing these services, reasonable measures will be taken to protect the Owner against defects and deficiencies in the work of the Contractor. Responsibility for the actual supervision of construction operations or for the safety measures that the contractor takes or should take cannot be guaranteed.
2. HOT proposes to provide oversight by an AWS Certified Welding Inspector, NDE Level III and NACE Level III Certified Coating Inspector on the referenced project for TRE. The objective of this project is to provide quality assurance surveillance of the erection, welding, sandblasting, and painting during the construction of the referenced water tank. Inspection and testing visits will be strategic and at the discretion of the Inspector and Engineer. The services to be provided will include the following:
3. Welding, Fabrication and Erection Inspection
 - Review welder qualification records and welding procedures before any welding commences.
 - Verify proper welding electrodes and electrode storage to be used on project.
 - Conduct inspections on shop fabricated components.
 - Conduct inspection of tank erection practices and fit-up.
 - Conduct Certified Welding Inspection per AWWA D100 during construction.
 - Approve Radiographic Testing as per AWWA D100.
 - Witness leak testing of floor lap weld seams.
4. The inspection methods to be implemented for the above inspection will consist of Visual Testing. All inspections will verify compliance with the Contract Specifications. An AWS Certified Welding Inspector and NDE Level III will provide oversight on all welding inspections.
5. Shop fabricated items will be inspected on the project site for the fabrication and weld quality per compliance to AWWA D100. If a shop inspection is requested, All travel and labor expenses will be negotiated upon selection of the contractor.

6. Surface Preparation and Coating Inspection

- Pre-surface preparation inspection.
- Measurement of ambient conditions.
- Evaluation of compressor and surface preparation equipment.
- Determination of surface preparation cleanliness and profile.
- Inspection of application equipment.
- Witnessing coating mixing.
- Inspecting coating application.
- Determination of wet film thickness.
- Determination of dry film thickness.
- Evaluating cleanliness between coats.
- Witness contractor conduct holiday testing of the inside coating system.
- Evaluate cure.
- Prepare a final inspection report to engineer and owner.

7. The inspection methods to be implemented for the sandblasting and coating inspections will consist of visual inspections, mil gauging, holiday testing, profile gauging and atmospheric measuring. All inspections will verify compliance with the AWWA D102-06 and contract specifications. The measurement of air temperature, surface temperature, humidity, dew point, coating thickness and holiday detection will be recorded in an inspector's logbook. The equipment to obtain such measurements will be supplied by HOT.

8. During onsite observations and inspections, HOT will fly a drone for photos and provide weekly progress email reports to the team. At the end of the project, once the tank is commissioned, a final report with documentation of the welding and coatings inspection will be provided.

9. All shop inspections will be considered separate from the field inspection visits. It shall consist of the above scope of items in accordance with AWWA, NACE and the contract specifications. Coordination and scheduling efforts shall be considered to maximize the inspection productivity. The Inspector shall be notified at least 10 days in advance of the time the shop inspection will be needed prior to shipping tank components to the project site. If a shop inspection is requested, All travel and labor expenses shall be negotiated once the contractor is selected.

10. **WORK EXCLUDED:** Work required for safely accessing the tank is not included in the cost of this project. It will be the contractor's responsibility for providing safe access to all areas of the tank for inspection and testing during the construction. OSHA approved staging will be necessary for the complete access of the tank.

11. The total cost for the above-mentioned services is based on a **Fixed Cost** for the pre-construction and construction phase scope of work provided. If re-inspections are necessary due to contractor performance deficiencies and non-conformance issues during the construction phase, the additional time will be documented and billed at the rate of \$130/hr.

CONSTRUCTION PHASE

Welding and Erection Inspection (Field)

NOTE: based on 5-6 visits

Radiographic Test Grading and Approval

NOTE: based on the required testing by AWWA D100

Surface Preparation and Painting Inspection (Field)

NOTE: based on 6-8 visits

Final Technical Inspection Report w/Project Documentation

Fabrication and Shop Surface Preparation and Priming Inspection

NOTE: shall be negotiated once the contractor is selected.

TOTAL COST OF SERVICE	\$14,560.00

TERMS:

This proposal is offered to acceptance within 45 days. Payments to be made within 30 days of invoice date.

CONDITIONS:

This proposal assumes that the tank site and pertinent information required to determine the scope of work will be accessible and that any restrictions requiring special work to obtain the site and information will affect the cost of this proposal.

INSURANCE:

HOT to provide insurance certificate upon request. HOT carries Commercial General Liability (2,000,000 aggregate), Auto Liability (1,000,000) and Worker Compensation (1,000,000).

TIME OF PERFORMANCE:

All inspection visits will be conducted on a hold-point basis or at the discretion of the inspector as required for maintaining a timely and quality construction schedule.

ACCEPTANCE:

Should you find this proposal acceptable at the prices, terms, and conditions offered, please indicate your acceptance by signing in the space provided and or provide a task order/purchase order.

Executed on this the _____ day of _____ 2023.

ACCEPTED



John H. Konzen
President
HOT Inspection Services, Inc.

ACCEPTED

Salvatore Pellittieri, P.E.
KSA Engineers

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